

1911 • FIFTY YEARS OF SERVICE TO COAL MINING • 1961

COAL AGE

MAY, 1961

Imperial Preparation p 80

Low-Vein p 90

New Enos Dryers . . p 100

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The Lubrication Operating Guide . . . p 113

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April 3, 1961

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Philadelphia, Pennsylvania

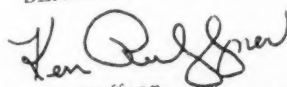
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We have used Hul-E-Mul for approximately 4 months, and have been using it 100% for 3-1/2 months on 60 pieces of equipment. We have cut our lubrication cost in half as compared to previously used conventional hydraulic oil. Performance of equipment has been, in virtually all instances, equal to that achieved when using a premium conventional oil and in some equipment the performance has been considerably better.

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Very truly yours,

SEANOR COAL COMPANY



Ken Ruffner
Superintendent of Maintenance

BOX SCORE

Mines using Hul-E-Mul 100% hydraulically . .	11
Other mines partially using Hul-E-Mul	54
Underground equipment satisfactorily being lubricated with Hul-E-Mul	380

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Coal runs the 8-minute mile from mine to river

THIS is the payoff end of a mile-long conveyor system that rushes 1200 tons of coal an hour from a Kentucky mine to the Ohio River. While barges are being loaded, the belts often work 40 hours at a stretch—are exposed to sun, rain, ice, and a steady stream of wet, sharp coal.

To stand the heavy loads, and to maintain 600 feet-per-minute speeds, the engineers in charge selected two B.F. Goodrich cord belts. Unlike other belts, made of rubber and layers of fabric, the BFG cord belt is made with cords running lengthwise, buried in

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Your B.F. Goodrich distributor can give you full information about the cord belts used in this conveyor system.

And, because he's a factory-trained specialist in rubber products, he can answer your questions about the many rubber products B.F. Goodrich makes for industry. *B.F. Goodrich Industrial Products Co., Dept. M-102, Akron 18, Ohio.*

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CONVEYOR BELTS



40-cubic-yard shovel stripping overburden at the Victoria Mine, Peabody Coal Company, Boonville, Indiana.

15,057,400 yards of overburden removed

with five **USS** Tiger Brand hoist ropes

This 40-cubic-yard shovel operates 85% to 90% of the time around the clock at the Victoria Mine of the Peabody Coal Company, Boonville, Indiana. It is rigged with a USS Tiger Brand $2\frac{3}{8}$ " shovel hoist rope 624' long and the 100' 10" long boom supports are made from $3\frac{5}{8}$ " diameter USS Tiger Brand Galvanized Strand.

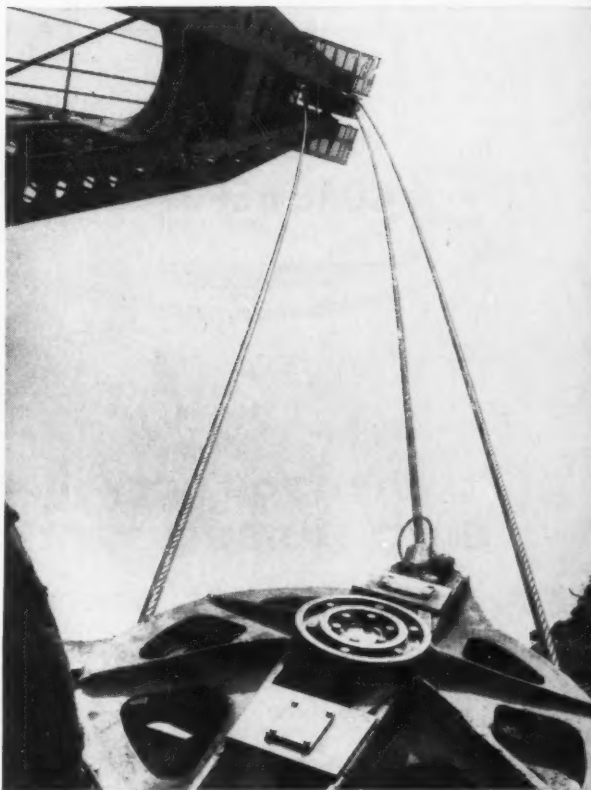
Production records for five hoist ropes show an average of 3,011,480 yards of overburden removed per rope. Such service is the main reason why USS Tiger Brand Wire Rope is used on so many big shovels. Jobs like this call for a wire rope that's engineered with the right combination of strength, flexibility and resistance to abrasion, fatigue and crushing. Tiger Brand fills the bill.

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Tiger Brand Wire Rope is designed by one of the industry's most capable staffs of wire rope engineers. It is made by a company that maintains the most complete research and manufacturing facilities in the steel industry. When you buy Tiger Brand you get the right rope for the job. It's available from a nearby distributor. And your installation is no further away than a phone call from experienced American Steel & Wire field service representatives.

For more information write American Steel & Wire, Dept. 1146, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

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USS Tiger Brand $2\frac{3}{8}$ " hoist rope that had a service life of more than 3,000,000 cubic yards of overburden.

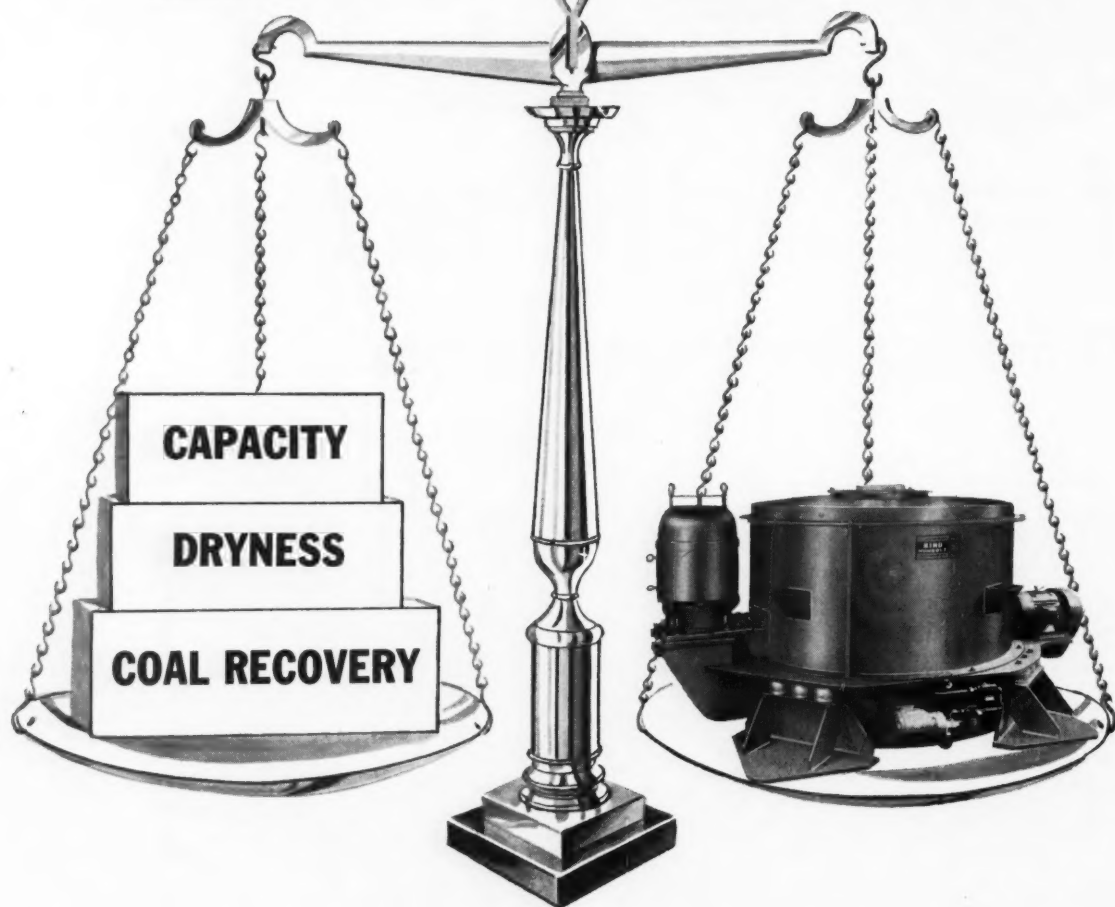


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when you put your minus $\frac{3}{8}$ " x 0 through the BIRD-HUMBOLDT Oscillating Screen Centrifuge

Some centrifuges offer you big tonnage at the expense of thorough moisture removal, or good dryness at the expense of high coal recovery.

Only the Bird-Humboldt gives you the best balance of all three — *capacity* as high as thorough *dewatering* permits; *high* recovery (98% plus), whatever the feed.

Compare the Bird-Humboldt with any other centrifuge on all three counts. Compare it also for *screen life* — up to 3000 hours or more in the Humboldt — and *power requirements* — less than 0.2 KWH per ton of dewatered coal. When you do, you'll specify the Bird-Humboldt.

Ideal for dewatering stoker size coal, too. The Bird-Humboldt gets minus $1\frac{1}{4}$ " x $\frac{1}{4}$ " so dry it cannot freeze in the cars, with virtually no degradation. It handles up to 100 tons or more per hour. Rugged construction assures long, uninterrupted service.

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This Month in

**COAL
AGE**

May, 1961

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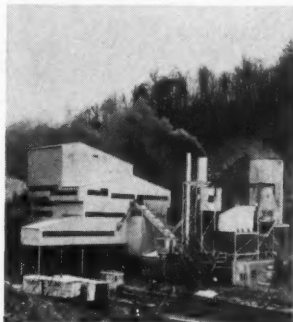
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**Preparation** Daniel Jackson Jr., Coal Age**2½% Ash . . . How Imperial Smokeless Does It p 80**

With a two-shift daily capacity of 8,000 tons of cleaned coal, the goal in metallurgical preparation at the new plant of the Imperial Smokeless Coal Co., Quinwood, W. Va., is a product with not over 2½% ash. This goal is being achieved. Collateral goals were minimum degradation, automatic sampling, minimum operating labor, elimination of stream pollution, and minimum 36-in clearance around equipment.

For the Job—Built by Roberts & Schaefer, the plant employs a jig for 6x¼, Barvoys-type heavy medium unit for 1½x¼, Concenco No. 77 double-deck tables for ¼x½-mm, Wemco-Fagergren flotation for ½ mmx0, H & P cyclones and Sieve-Bends, Reineveld centrifuge, Eimco filter and H & P fluid-bed dryer for ¾x½ mm.

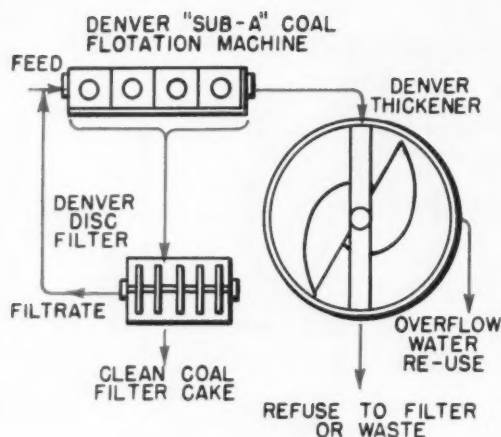
**Continuous Mining****New Thin-Seam Continuous Miner p 90**

Employing a Joy Compton CU 42 continuous unit, a 7-man crew has mined better than 300 tons per shift from the 36- to 41-in Darby seam under less-than-favorable conditions. Operated by the Harlan Fuel Co., Yancey, Ky., the miner removes coal with two barrel-shaped cutter heads pivoting on arms connected to the main chassis. Each arm may be independently raised or lowered 18 in to mine coal of varying thickness, and each may be operated independently. In advancing an 18½-ft opening, the unit cuts a curved face and removes 2.88 tons per cycle. Size consist compares favorably with that for conventional mining. Sketches show details of the mining plan. Preparation facilities, including a Daniels DMS washer, No. 77 tables and CMI dryer, yield a product with 2.6% ash, 0.67% sulphur and 13,491 Btu.

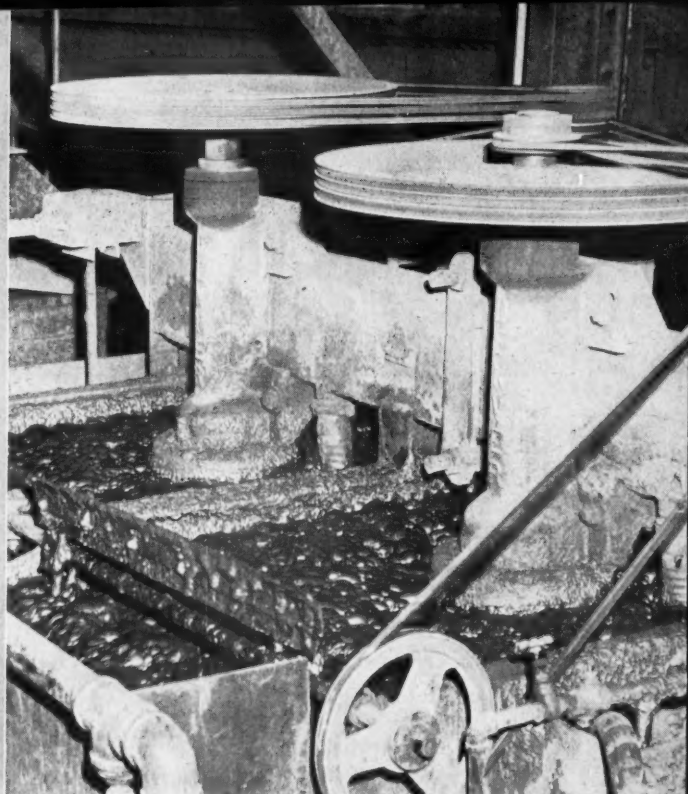
**Belting Service****Using Belt-Conveyor Repair Service p 96**

Belting represents 40 to 60% of the initial cost of the belt-conveyor system. Therefore, before belting is discarded the owner should make sure that it is beyond salvage and repair, since the difference may be up to one-quarter to one-half the cost of new belting. Salvage and repair apply primarily to ply belts, which still have a definite place in mining. Even where a change is made to solid-carcase, ply footage should be retained as long as it has useful life. Otherwise, valuable investment is lost. Cost of repairing and reconditioning in relation to benefits is the first step. Estimation of this cost and actual reconditioning may be done by the coal company or by an independent repair shop specializing in such repair and reconditioning.

(Continued on p 7)



Typical flowsheet of a modern coal washery where a DENVER closed-water system provides for flotation of coal fines and reclamation and re-use of plant water.



Clean up your water system...eliminate plant bleed and water pollution profitably with DENVER Fine Coal Recovery Systems

Denver Fine Coal Recovery Systems are designed to handle low-solids black water (10% solids or less of — 8 mesh x 0) from coal preparation plants.

Benefits include elimination of plant bleed...washery water cleaned for re-use...and maximum recovery of low ash, marketable coal fines for added profits. The only water lost is surface moisture of coal and refuse product and the system provides a reduced bulk of coal-free refuse, extending the life of your impounding area.

You are invited to use DENVER Testing Service to determine amount of coal recovery to be expected and to supply reliable data on your flotation, settling and filtering needs. Send a 5-gallon slurry sample to DENVER Testing Division, 1755 Blake Street, Denver, Colorado.

TYPICAL PLANT RESULTS FROM OPERATIONS ON COAL IN WEST VIRGINIA USING DENVER "SUB-A" COAL FLOTATION MACHINES

	Plant A	Plant B
Feed GPM Pulp	1200	2600
Feed % Solids	8-10	6-8
Feed % Ash	9-12	17-18
Feed Size Range	— 16 mesh x 0	— 20 mesh x 0
Coal Concentrate % Ash	4.5	5.5
Coal Concentrate % Solids	30-40	28
Refuse % Ash	60-70	65-75
Refuse % Solids	1-2	1.5-2.0
Total Filter Area*	535 sq. ft.	1200 sq. ft.
TPH Flotation Coal Produced	20-30	40-45

*Generally up to 5 CFM vacuum pump displacement required for low moisture and ideal filter conditions on clean coal recovered by flotation.

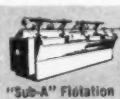
DENVER—Pioneer in Fine Coal Cleaning by Flotation



"The firm that makes its friends happier, healthier and wealthier"



Steel-Head Mills



"Sub-A" Flotation



Agitators



Diaphragm Pumps



Automatic Samplers

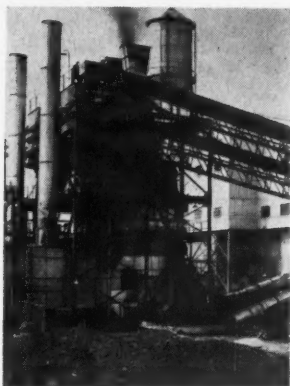


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Drying

Fluid-Bed Units Dry 1x0 Coalp 100

Installation of a pair of new Link-Belt Fluid-Flo thermal dryers has given a further boost to overall efficiency at the preparation plant of the Enos Coal Mining Co., Oakland City, Ind. One of the two units handles $\frac{3}{16} \times 10$ M, 10% moisture, 165 tph; the second, $1 \times \frac{3}{16}$, 165 tph, and $\frac{3}{16} \times 0$, 100 tph, both at 4% moisture. The dryers comprise (1) a furnace, (2) a drying chamber with constriction plate to fluidize the coal, and (3) a separator to remove solids from the exhaust. Space considerations resulted in an open-air installation 125 ft from the main plant. Total connected plant load is 1,080 hp. The prime objective of wider market acceptance for the coal has been achieved.



Stripping

Special Shovel Breaks Thin-Seam

Loading Bottleneckp 106

A special coal loader with a horizontal-thrust action helped break a loading bottleneck at the stripping operation of the Oakman Coal Co., Oakman, Ala. Combining the fast swing of the shovel turntable with a 7-ft independent loading action, a Koehring 205 Skooper makes it possible for the operator to skim off the 18-in seam without digging into the bottom rock. In the near future the company hopes to use the unit to recover a 4-in layer of coal a short distance under the main seam. Oakman uses a TD 24 bulldozer and a 93 M 3-yd shovel to remove 20 ft of overburden, which is broken with an ammonium nitrate-oil mixture. Before the new coal loader was purchased, a $\frac{3}{4}$ -cu yd shovel could not keep pace with the stripping units. The new unit stays well ahead and will be used in a second pit.

(Continued on p 9)

This Month in **COAL**

STILL DRAGGING—Recession continues to reign in coal, though the low point perhaps may have been passed. After dropping to nearly 6 million for the week ended Feb. 11, the bituminous rate has crawled up to a little over 7 million. There will be some additional increase, but 8-million-ton weeks in any number are still for the future—perhaps in the last half.

The expected anthracite relapse from the elevated rates generated by the winter cold snap took place on schedule, though leaving the industry slightly ahead of last year as of the end of the first quarter. Indications are that the rate for the remainder of the first half, and perhaps the entire year, will approximate or drop slightly under that for 1960.

IS THE UPTURN HERE?—The low state of bituminous reflects, in addition to some further competitive inroads, the general business depression, with steel the continuing bellweather. Is the turnaround here? At least one economic service says flatly that the recession is behind us, and there are some signs that it is correct in this view. The steel rate, for example, is strengthening. But assuming that the turnaround has or is about to occur, the effects are not likely to be felt to any significant extent until the second half. Meanwhile business continues to play everything quite close to the vest.

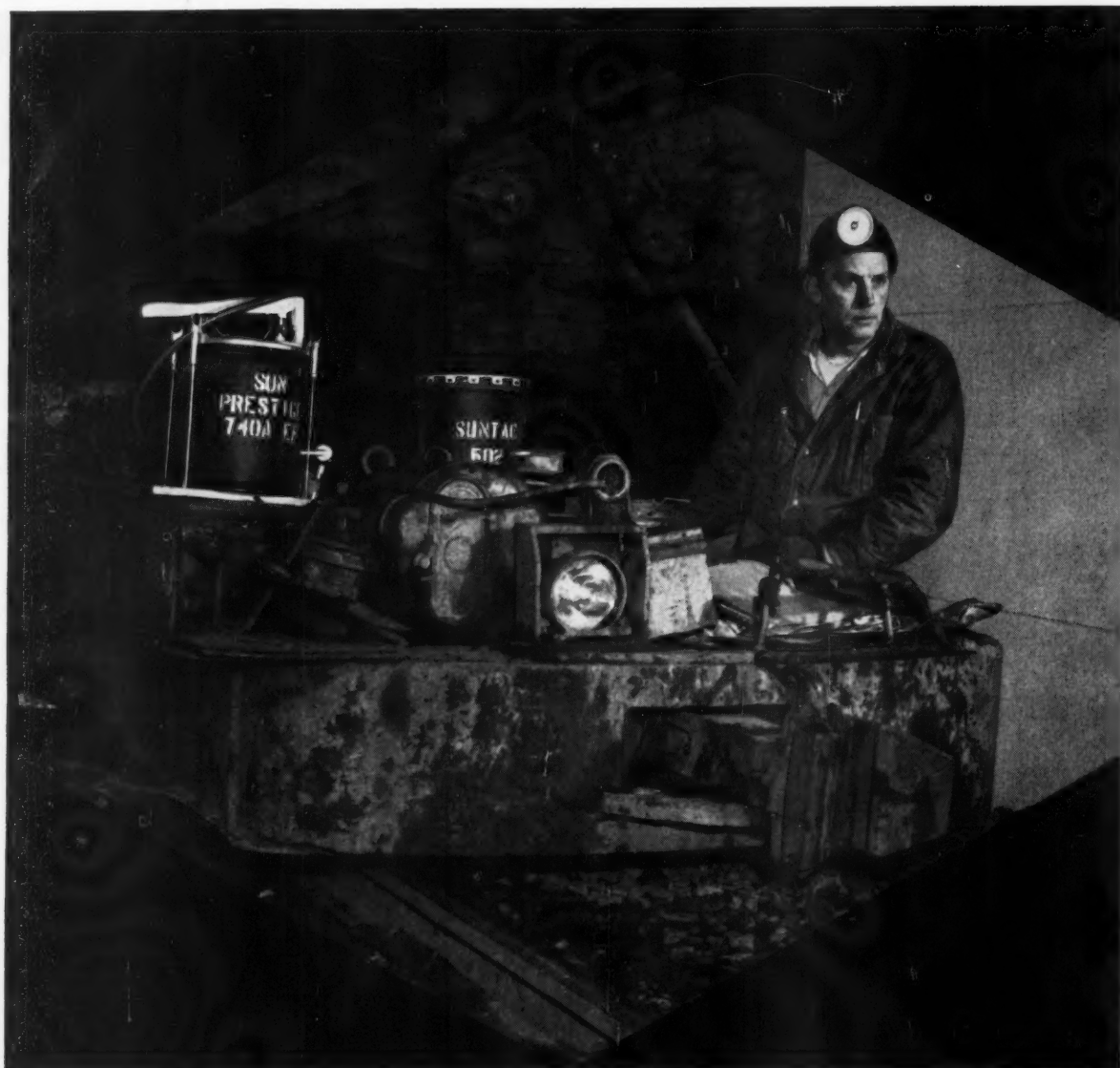
SAME DIFFERENCE—The New Frontiersmen have been on the job long enough now so that some assessment of their attitudes and aims can be made. One conclusion is that the New Frontier is strikingly like the New Deal and the Fair Deal. In fact, it is going both of them one better

in its drive for public power, including hydro and nuclear development. How far will Congress go along still is a question but the tendency will be for it to move at least a part of the distance. And it probably can be expected that in any competitive battles the Frontiersmen will be more inclined to favor coal's competitors. On the credit side, on the other hand, is the administration endorsement of the idea of a National Fuels Policy study.

MORE FOR CANADA?—Though Canada is complicating the life of the U. S. coal man with its western gas, it may be getting in position to favor him with increased coal takings. In other words, the Ontario Hydro Commission is now asking for bids on coal for the first of its steam plants. In all probability, unless the Canadian government wants to subsidize fairly heavily its own output, the coal will come from the U. S. And it will be a growing business.

GAS COMPETITION—Coal isn't through with competition from gas in utility and other heavy-fuel applications, but gas suffers a little harder all the time, even in areas which it—and coal—thought it had solid only a few years ago. Coal therefore can expect steady progress, with perhaps the biggest hazard arbitrary action by the government to cut field prices and pipeline and distribution charges. This, however, is not likely on any major scale.

SNOW MELTING—Suggestions are being made in various cities that new buildings be required to install sidewalk and even street heating to melt snow. If a few such ordinances should get adopted, a trend boosting use of electricity even more might develop.



Step up tonnage, cut costs, reduce underground inventories . . . with Sun 740-A EP Universal Mining Machinery Lubricant and Suntac 502, one of the many Sun job-fitted hydraulic oils. Sun 740-A EP clings like grease, pours like oil. It is water and heat resistant . . . gives excellent rust and corrosion protection . . . won't thin down under severe service. And it meets all daily underground require-

ments, except your hydraulic needs. Pioneering of this basic lube program by Sunoco even sparked development, in conjunction with a leading equipment manufacturer, of the well-known two-output pump shown above. It can be used, with a product like 740-A EP, to fill gear cases at high *volume* or on pressure fittings at high *pressure*. Come see us at the Coal Show, May 15-18, 1961—Booth 620.

Why SUNOCO for your 2-product underground lube program?



Because: you get the product quality it takes to meet all your daily underground needs . . . job-fitted by men who developed the simplified lube program . . . backed by the service you have a right to expect. Get squared away on real savings. See your Sunoco man . . . or write to Sun Oil Company, Philadelphia 3, Pa., Dept. CA 5. In Canada, Sun Oil Company Limited, Toronto and Montreal.

PIONEERING PETROLEUM PROGRESS FOR 75 YEARS

Operating Guide

Lubricants and Lubricating

Equipment p 113

Fifth in a series of Coal Age Operating Guides is this 16-p section on the purpose of lubrication, selection and application of lubricants, and types of lubricating equipment. It starts with a discussion of friction and winds up with the steps necessary to establish an effective lubrication program. Major sections are:

Purpose of lubrication.

Types of lubricants.

Selection of lubricants.

Lubricating equipment.

Lubrication program.

Special—List of lubricant and lubricating-equipment suppliers and the products they provide.

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THIS MONTH . . . in Mining Practice

ANOTHER WHACK AT DUST—Settlement of the problem of dust at the working face will be a matter of gradual progress, with no sudden breakthroughs. In addition to methods tried in the past or presently being employed, another attempt is now being made to apply dust-collecting equipment to cutting operations. It already is employed in roof-drilling. A workable system eliminating or sharply reducing the use of spray water is, of course, an objective much to be desired.

FEATHERBEDDING BY LAW—A favorite scheme of legislators over the years, especially those who find it difficult to capture votes any other way, is to advocate legislation requiring the employment of extra people on certain jobs and equipment. The railroads have been prime victims over the years, but coal has escaped almost completely, largely as a result of the stand against featherbedding taken by the union. But there are still attempts, as in Pennsylvania, where a bill has been introduced requiring helpers on cutters, loaders, continuous miners and bolters. This bill probably will die, but, as noted, some legislators are always in there pitching.

HYDRAULIC PITCH UNIT—The grapevine brings word of the construction for the USBM of an experimental hydraulic mining unit for pitching veins, scheduled for eventual trial in anthracite. Apparently it will be patterned somewhat on the earlier units developed for gilsonite. Meanwhile, the practicability of hydraulic mining in level seams awaits further study and field test.

SOUTH AFRICAN DRILL BIT—For use with pneumatic equipment, South Africa has developed the "saddleback" tungsten-carbide tip which is curved inwardly rather than outwardly like the conventional chisel bit. Reporting on the design and field results, Optima publication of the Anglo American Corp. of South Africa, Ltd., notes that drilling speed is greatly increased, there is a major reduction in rate of tip wear, and cuttings are much coarser in nature, thus helping with the dust problem.

CHAIN FACE SERVICE—In at least some quarters there is a feeling that the modern chain-type conveyor designed for the service may experience accelerated growth as one answer to the problem of serving the newer, higher-capacity face units—either loaders or miners. With more horsepower and a higher speed, both already reached or viewed as eminently achievable, and with bridge units for the connection, a high-capacity unit able to operate continuously over long periods of time becomes a reality. There probably will be quite a few more chain conveyors in the lives of facemen in the future.

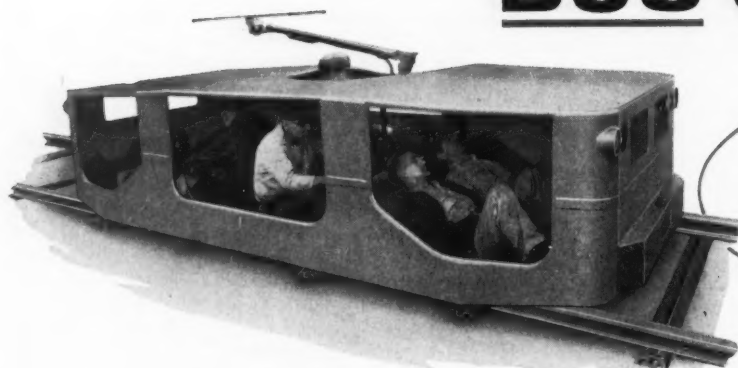
ONE ANSWER—When R-C (remotely controlled) mining becomes a commercial reality, one of the problems will be rock falls in the hole. Now the inventors of the R-C unit now under commercial test have come up with an idea for conveyors that can handle the rock without men going inside (U. S. Patent No. 2,978,235).

coming and going

every
you take your profits on ~~the~~ run

with the Lee-Norse

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MINE PORTAL BUS

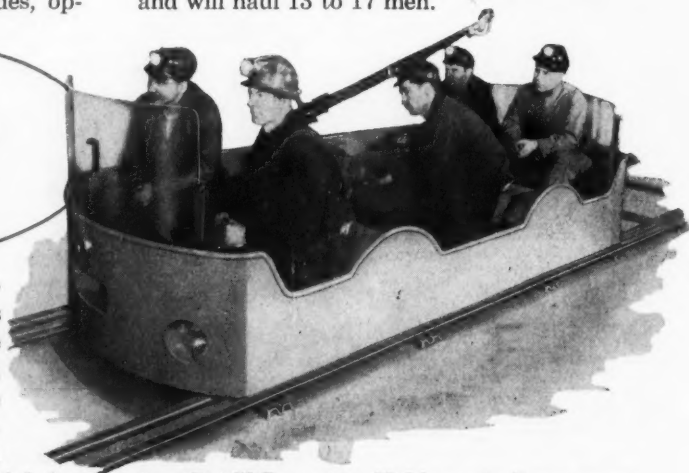
■ There's no wasted motion with this self-propelled Portal Bus because it is fast on the take-off, saving manpower time for conversion into more tonnage. And it is designed for safety, with hydraulic operated running brakes plus mechanical emergency and parking brakes direct on the wheels. For severe grades, op-

tional electric dynamic system produces braking effect from the motor for *extra* safety under all conditions. Also the split roof construction gives operator unimpeded, all directional view, while the trolley pole is always within quick reach. This bus is powered by 15 H.P. motor and will haul 13 to 17 men.

Lee-Norse

MINE JITNEY

■ The Mine Jitney is the "Jack-of-all-Trades" of the mine fleet because its versatility enables it to be used on the regular job and for emergency. It can handle the job of furnishing fast, safe transportation of key personnel, maintenance crews and special groups; and can double up as an ambulance or fire-fighting equipment car. Designed with twin braking systems for added safety. Powered with either



5 or 7½ H.P. motor. Holds up to 7 men comfortably. Optional equipment: Plexiglas windshield, fire extinguisher, stretcher equipment.



Lee-Norse Company

CHARLEROI, PENNSYLVANIA

SPECIALISTS IN COAL MINING EQUIPMENT

The Coal Commentator

Parts and Production

Good maintenance, unfortunately, sometimes is more talked about than practiced. When you have good maintenance you get the maximum in productivity with the minimum in cost for repair parts and avoid such situations as this—an actual one recently reported to a member of the *Coal Age* staff: a parts cost of 50¢ a ton with a production per unit much below what should have been achieved.

While keeping parts cost down it must also be remembered that lack of a part when it is needed can cause really serious losses. The period of austerity which coal is now in, according to further reports to the editors, may be causing an undue reduction in parts inventories—at the mines, in the hands of distributors and even in the manufacturers' warehouses. In any event, it is always in order to look into the situation to see if inventories are right for the job and at the same time are not excessive. And of course, when you have to replace a part, it should be a quality replacement. It's money in the pocket both short and long run.

Red Necktie

Some perhaps would say that the colorful figure is a vanishing phenomenon in coal mining and the industries that serve it—and perhaps they would be right. At any rate, the group now will be diminished by one, by the forced retirement from active operation of Alfred E. Pickard, of Mt. Vernon, Ill., otherwise known worldwide as "Red Necktie." Reason? A second coronary and a firm putting down of the foot by the doctor.

Though he can still circulate and occasionally take a look at the books he won't be on the scene as in the past—and it probably is quite fair to state that things won't be quite the same. He was definitely of the "one-of-a-kind" breed, as anyone who has ever met him can testify. And in his business, which still goes on, he was dedicated to giving value received. And though he will not be active, that will continue to be the basic approach of the service organization he has built up over the years.

Amsterdam Outlook

The group of those who may be faint-hearted about the prospects for coal imports into Europe does not include N. Snijders, managing director of the Port of Amsterdam, recently in the U.S. to expound the opportunities for American concerns in

the current expansion program, which would double the size of the port by 1975.

Looking ahead to 1975, Mr. Snijders declared that West Germany will be importing 31 million tons by that time, while The Netherlands will require 8½ million from outside the community. "Of course," Mr. Snijders observed, "it goes without saying that those companies operating close to the scene and adequately stocked will get the bulk of this business."

Mr. Snijders wants business for his port and U.S. producers want tonnage for their mines. It looks like it should be easy for both to gratify their desires. For further details, address The Netherlands Trade Commission, 10 Rockefeller Plaza, New York 20.

Koenig Too

With somewhat of a blush, your commentator must acknowledge another memory lapse. In the March issue, in noting the recent honor to James D. Reilly, he stated he knew of no other coal man that had been made a Chevalier of the French Legion of Honor. But there was, though this man is no longer in coal but back in his first love—metal mining. He is Robert P. Koenig, president of Ayrshire Collieries Corp. at the time of receiving the ribbon (1946) and now president of the Cerro Corp., one of the world's major copper producers.

Thanks go from your commentator to Roy Dean, Ayrshire vice president, for calling attention to the omission, with an extra bow for making it possible to note that coal has attracted men of such caliber that honors such as this can be numbered in multiple.

Second Operator . . . or Helper?

Are two operators better from the standpoint of final results than one operator and a helper? The short—and appropriate answer—is: "It depends"—on the particular job, machine, situation, and so on. But there are situations where it can pay off, as in a recent report to *Coal Age* editors noting employment of two operators rather than an operator and oiler on a shovel. The operators alternate running and oiling every hour, and the results have been two: higher production and better servicing of the machine.

As noted, using two operators must of necessity depend on circumstances, and it might have to be conceded that the opportunities are few. But in view of the cost of key units today—and the fact that penalties incurred when they are operated inefficiently or go down completely are so great—this step should be taken when it will help.

"Bargain basement" bits cost you more in lost tonnage!



ADN STYLE

Auger Bit—Tipped with the finest carbide made—for longer tool life . . . "V" prong for faster penetration. (Square and Hex shank.)



CC-B STYLE

Machine Bit—Negative Rake, stronger cutting edge . . . tip, in compression, with greater support utilizes maximum carbide strength . . . fewer bit changes.

Carboloy® quality machine bits bite out more tonnage per shift . . . last longer . . . give you the best return on your investment.

When did you last buy a bit at a bargain? Did you really save? Probably not. "Bargain basement" bits have a real knack for costing you more than you save in the first place.

That's why you'll never find Carboly mining bits "on sale in the bargain basement." Quality pays for itself over and over—and we refuse to sacrifice quality for the sake of a few extra "one-time" sales.

When you choose Carboly mining bits for *your* operation, you'll get more tonnage per shift . . . the bits will last longer . . . and you get a *real* return on the money you've invested.

Your Authorized Carboly Mining Tool Distributor has all the facts. And, there's a Carboly engineer in your area to help you. Write: *Metallurgical Products Department of General Electric Company, 11120 E. 8 Mile Blvd., Detroit 32, Michigan.*

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MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS



United Electric Coal Co. equips new 45 cu. yd. shovel with Yellow Strand

Along the banks of the Illinois River at Banner, Illinois, a new 45 cu. yd. shovel works day and night on a stripping operation. Every 8-hour shift 17,500 tons of shale, rock and clay overburden are stripped to reach a high quality coal seam 35' below ground.

Banner is the first coal mine, built on a river bank, with a conveyor 600' long, to carry coal directly from preparation plant to river barge. Production at Banner Mine is 4,000 tons daily.

Because each operation must go like clockwork, United Electric Coal Co. specifies Yellow Strand Wire Rope. Among the various rope sizes, the big shovel's two main hoist wire ropes of identical lengths are 544' of 2¼" 6 x 41 Yellow Strand Right Lang Lay, IWRC

with tapered ends and welded with becket loops. Two other shovels at Banner, plus a dragline and barge puller, are 100% Yellow Strand.

No matter what size wire rope, for large or small shovels, Yellow Strand can be depended upon to be trouble-free. Yellow Strand engineers will be glad to help you solve your shovel wire rope problems. Call them soon. *Broderick & Bascom Rope Co., 4203 Union Blvd., St. Louis 15, Mo.*

Yellow Strand[®]
WIRE ROPE

*The newest reason to make
your next tandem a FORD:*

'61 FORD HEAVY DUTIES

GIVE TWICE THE CAB, FENDER AND RADIATOR LIFE !

Rugged Ford Heavy Duties utilize heavier gauge steel, sturdier reinforcements, and a new independent mounting system to separate cab, fenders and radiator. This stronger construction, with each component *individually* frame-supported, doubles cab, fender and radiator life—cuts downtime delays and maintenance expense.

CAB—A 25% heavier floor pan and toeboard provide a solid base for greater cab durability. New full-length door pillar reinforcements and stronger inner door panels minimize door sag. New triangular mounts keep cab level and protect it from frame-movement stresses.

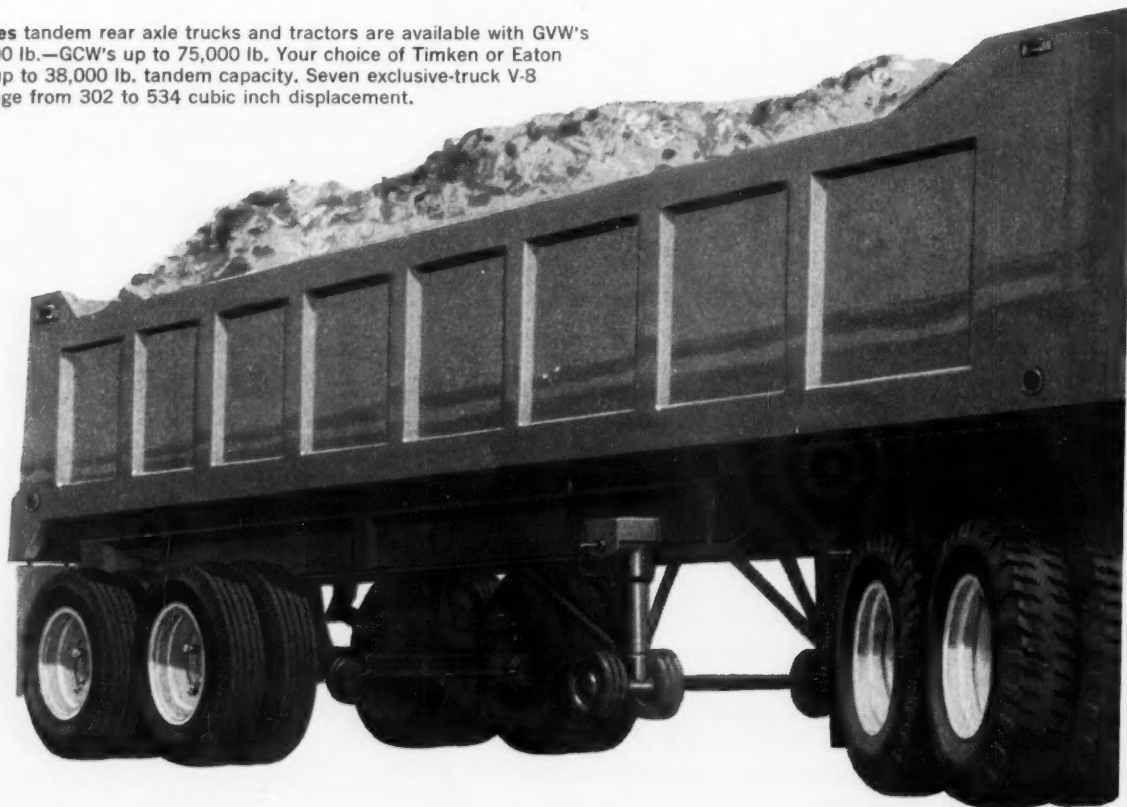
FENDERS—Ford fenders are 25% heavier gauge, too. They are bolted to a rubber-cushioned transverse support in front

for needed flexibility. Fender-wide rear brackets provide necessary rigidity. The removal of only 8 bolts permits pulling the fender for rapid access to engine.

RADIATOR—New Ford "lock-seam" construction doubles the solder area on key seams, and heavier gauge tank and header walls provide increased radiator strength. "Horse collar" mounting on rubber pads soaks up vibrations and diagonal braces at sides give solid support.

Ford's separate mounting of cab, fenders and radiator frees them from frame-movement stresses that occur when these parts are rigidly attached to each other. Result: failures and service costs are reduced even in tough off-road operation.

Ford T-Series tandem rear axle trucks and tractors are available with GVW's up to 51,000 lb.—GCW's up to 75,000 lb. Your choice of Timken or Eaton axles with up to 38,000 lb. tandem capacity. Seven exclusive-truck V-8 engines range from 302 to 534 cubic inch displacement.



SEVEN MORE REASONS WHY IT'S GOOD BUSINESS TO DO BUSINESS WITH FORD!

You save from the start with Ford's traditionally low prices, and your savings continue with low operating and maintenance costs. These facts are documented by certified test reports from America's foremost independent automotive research firm. Ask to see these reports. They're on file at your Ford Dealer's.

In addition to these dollar-and-cents savings, the following bonus benefits are yours with Ford Trucks:

- 1. Rigid quality controls** give you the strongest safeguard of truck reliability ever. Modern, *exclusive-truck* manufacturing facilities, with emphasis on quality every step of the way, are designed to give you a Ford Truck that is as free from defects as a truck can be. Tangible results of these high standards are Ford's new warranties.
- 2. Exclusive 100,000-mile warranty** (or 24 months) on 401-, 477- and 534-cu. in. Super Duty V-8's is the most liberal in the industry. Each major engine part (including block, heads, crankshaft, valves, pistons, rings), when engine is used in normal service, is warranted by your dealer against defects in material or workmanship for 100,000 miles or 24 months, whichever comes first. The warranty covers full cost of replacement parts . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter.
- 3. 12,000-mile warranty** (or 12 months) on all 1961 Ford Trucks of every size is further evidence of the confidence

Ford has in its quality controls. Each part, except tires and tubes, is now warranted by your dealer against defects in material or workmanship for 12 months or 12,000 miles, whichever comes first. The warranty does not apply, of course, to normal maintenance service or to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points.

4. Special fleet financing can be arranged by your Ford Dealer. It's available for owners of two or more trucks, and provides the opportunity to precisely tailor payments to your income patterns or depreciation schedules. This fleet-fitted financing offers substantial savings and frees your working capital.

5. Sales engineers and service specialists in 36 district offices are on call to solve special truck problems. Working with both dealers and customers, these experienced truck men represent another extra step Ford takes to provide your continued satisfaction.

6. Replacement parts depots at 26 strategic locations across the country quickly supply needed parts from ample stocks. Ford's entire supply system is geared to give you faster service and reduce costly downtime . . . *wherever you are.*

7. 6,800 Ford Dealers, including 280 specialized Heavy Duty truck dealers, can keep your trucks ready to go wherever they go. From coast to coast, fast Ford service—gas and Diesel—is always close at hand.

From Super Economy pickups to Diesel-powered tractors, you can now fill every truck need up to 76,800 pounds GCW with a modern, money-saving Ford Truck.

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NOW... a new source for hydraulic fluid concentrates... ATLANTIC HYDRAULIC-FRC

Atlantic HYDRAULIC-FRC meets your needs for a high-grade hydraulic lubricating oil concentrate at a reasonable price. It mixes easily with water to form an outstanding hydraulic fluid. By using a concentrate, you can avoid premixing costs and freight charges for water. And the U.S. Bureau of Mines approval number 30-5 assures you that the resulting emulsion will be fire-resistant.

Emulsions made with HYDRAULIC-FRC react to packings, paints and seals exactly like straight petroleum oils. Machines originally designed to use these oils do not need to be altered.

HYDRAULIC-FRC provides excellent stability. Finished emulsions also pass the ASTM rust test D665, and metal surfaces that come in contact with them will be protected from costly rusting.

An experienced Atlantic sales representative will be happy to discuss the benefits of HYDRAULIC-FRC in greater detail, and aid in the design and installation of economical mixing equipment which can achieve important savings. Get in touch with him by calling or writing the Atlantic Refining Company, 1100 Chamber of Commerce Building, Pittsburgh 19, Pa.

THE ATLANTIC REFINING COMPANY



**LUBRICANTS • WAXES
PROCESS PRODUCTS**

9 ways to cut production costs...



LONG-AIRDOX COMPANY • DIVISION OF MARMON-HERRINGTON COMPANY, INC. • OAK HILL, W.VA.

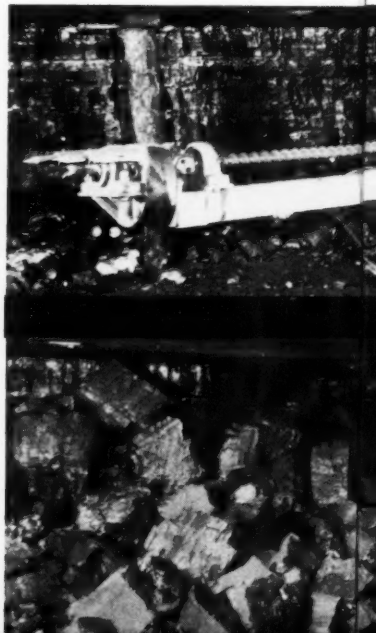
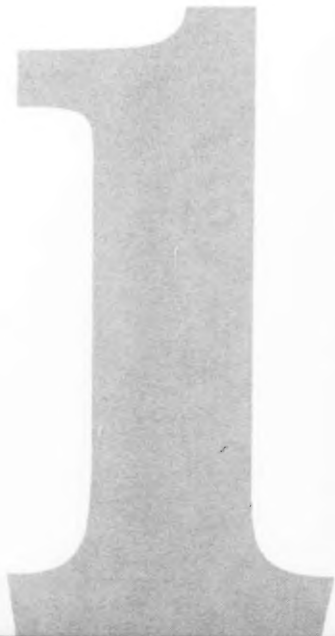
LONG-AIRDOX Mobile Multiple Shooting System

Single unit drilling, multiple shooting machine provides fast operating cycle for high-capacity production

Mobile Multiple Shooting is a new concept that greatly increases the efficiency and economy of Airdox shooting. A mobile drill does the drilling. A mobile carrier—the TDF drilling and shooting machine or a battery-powered shot fireman's car—transports automatic discharge Airdox tubes,* sequence valves,† etc.

*U.S. Patent No. 2,794,395

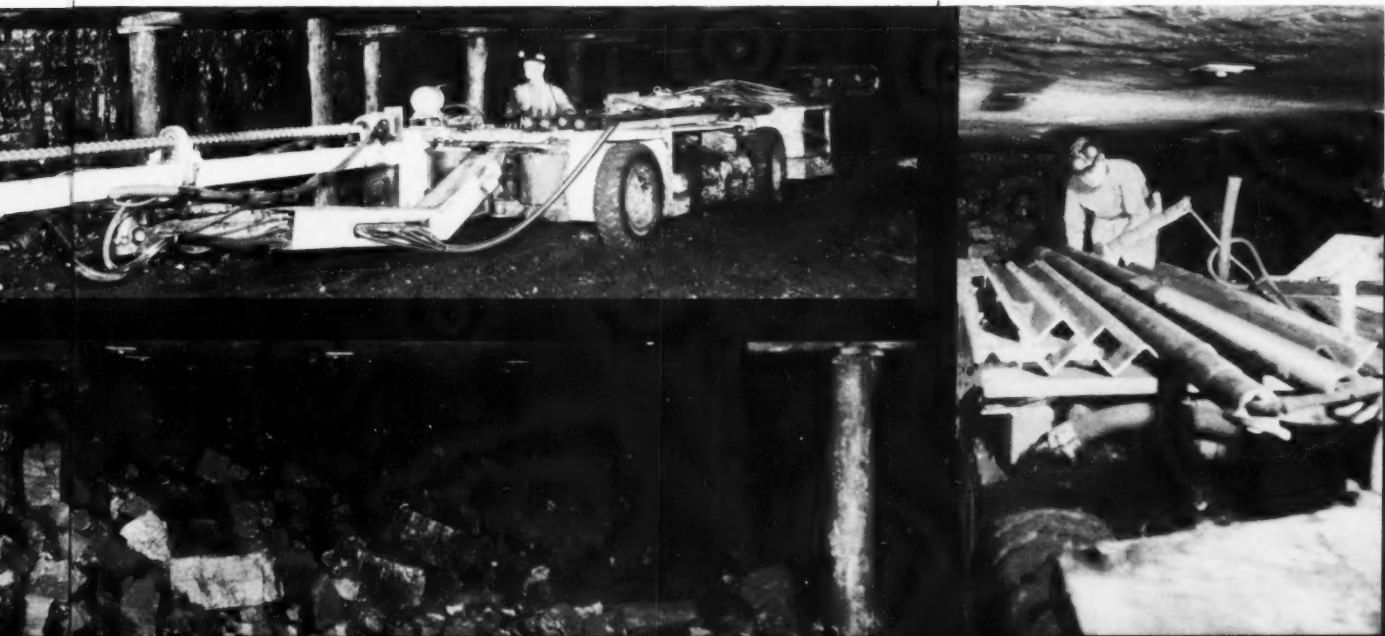
†U.S. Patent No. 2,858,764



Multiple shooting results from perfected sequence valve development so that one trip to the blow-down valve shoots any number of tubes in rapid, automatic sequence. It makes Airdox shooting practical and economical for all conventional mining and offers these advantages:

- Faster cycles—no waiting for smoke to clear
- Better loadability—coal is heaved outward for easier, faster loading
- Full undercut depth realized—square faces and ribs—more coal per cut
- Especially suited to deeper cuts
- Low cost—based on clean coal only
- Better sizing for higher realization and less expensive cleaning
- Coal has firmer structure—better size stability on the way to market
- Safety

© 1961, Long-Airdox Company



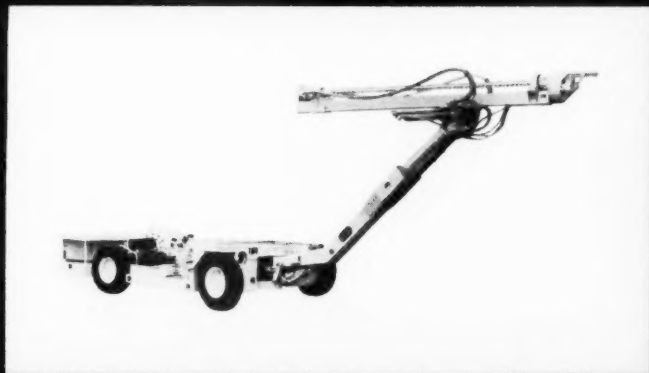
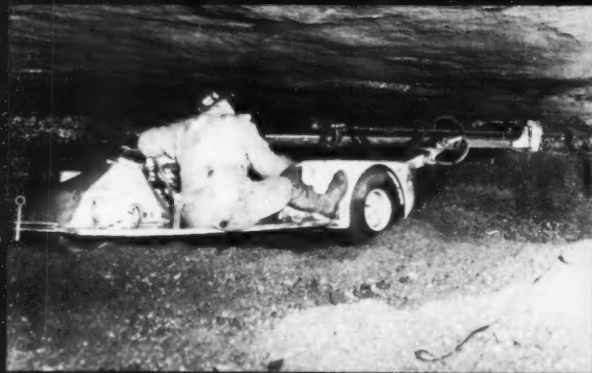
A LONG-AIRDOX First—TDF Mobile Coal Drilling-Shooting Machines...designed for combination drilling and shooting

The introduction of the Long-Airdox TDF drill series in 1959 made *high speed* mobile drilling available for all underground mining. Today it's an economic necessity. Previously mobile drilling was expensive, cumbersome, and slow—was not available for medium or thin seams.

Drilling full depth holes at as-

tounding speeds, the Long-Airdox mobile drill takes its place in the cycle behind the cutting machine. Drilling speed is such that shooting may be combined with drilling as one element in the cycle. Drilling and multiple shooting combined can be accomplished in comparable time with either cutting or loading.

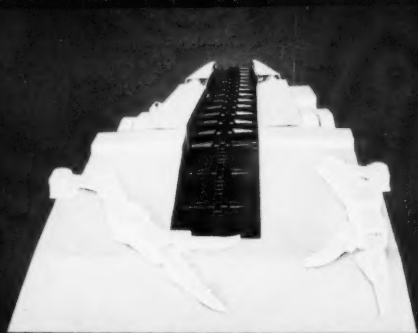
2



LONG-AIRDOX 188 and 588 Single Motor Loading Machines offer these advantages over competitive designs:

- **COST LESS** to buy, to operate, to maintain.
- **HIGHER CAPACITY** — More arm strokes per minute give higher capacity.
- **MORE EFFICIENT GATHERING**—Double arms gather material more smoothly and deeper into conveyor with less scattering.
- **BETTER PENETRATION** — Double arms permit 30% shorter strokes, 30% more torque per stroke. More strokes per minute give faster penetration.
- **BETTER TRAMMING AND STABILITY**—No separate electric drives or complicated controls. Simple drives. No lunging. Longer crawler wheelbase gives better stability.
- **GREATER VERSATILITY** — Applicable to all conditions and all popular mining systems.
- **UNUSUAL MANEUVERABILITY** — Full independent crawler control combined with long wheel base permits machine to turn in its own length.

3





4

LONG-AIRDOX "Full Dimension" Conveyor Systems for conventional or continuous mining

The "Full Dimension"* Extensible Conveyor System is a proved method of mining that is currently providing unusually high productivity under a wide range of operating conditions.

- Gives continuous haulage efficiency and higher capacity with shuttle car flexibility.
- "Full Dimension" has extreme extensibility and articulated side reach.
- Mines normal patterns—either advance or pillaring—from a single conveyor.
- Mobile feeder-belt combination produces an ideal belt conveying condition.
- Heavy duty mobile conveyor train moves only as miner or loader moves—not subject to wear of traveling back and forth to a loading point.
- It's the practical, economical extensible conveyor system for all seam heights.

*Registered Trademark, U.S. Patent Office

5

"Lo-Rope" Belt Conveyors for underground applications

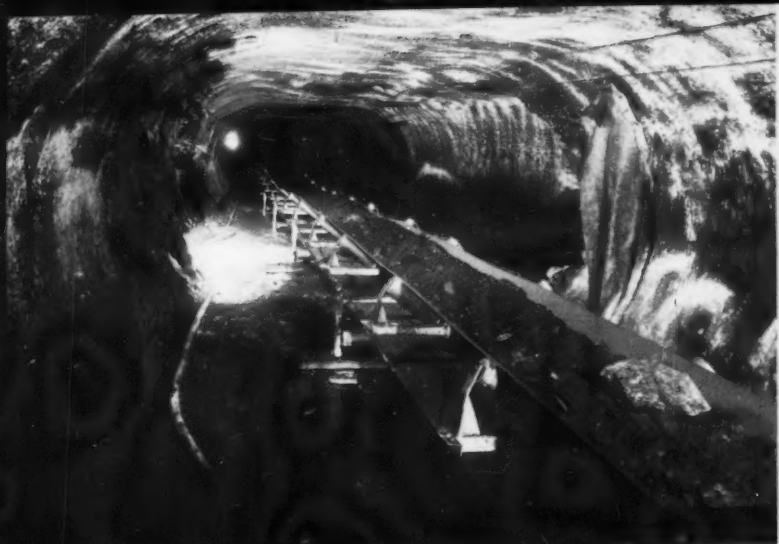
Long-Airdox perfected modern wire rope side frame belt conveyor design with the introduction of the "Lo-Rope" principle. This Long-Airdox development, the "Lo-Rope" Belt Conveyor,* is a drastic departure from old-fashioned designs in that carrying idlers mount on top of the wire rope side frames.

Proved "Lo-Rope" advantages:

*U.S. Pat. No. 2,896,774

6

- Belt stays centered — belt motion tips idlers in direction of belt travel—provides self-training.
- Conveyor stays aligned — load can't pound idler connections — "Platform Rocker" support stands can't walk out of position.
- Belt capacity increased — fixed deep troughing angle (20° , 27° , or 35°) centers load better.
- Belting lasts longer — can't be cut by hanger stands.
- Ropes out of the way for safer handling of men and supplies.
- Wide range of drive units, tail sections for specific requirements.



LONG-AIRDOX Chain and Belt Conveyors for outside haulage

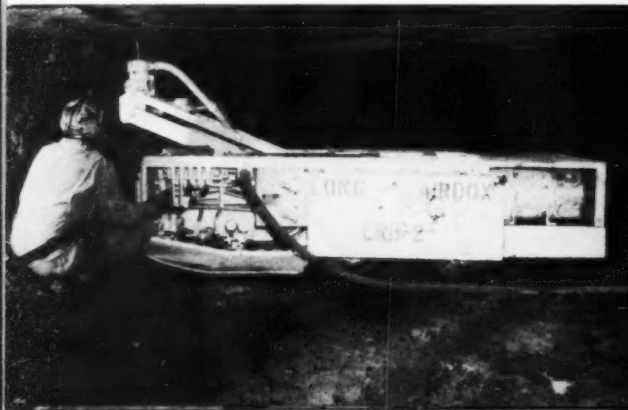
Long-Airdox makes both chain and belt conveyors for all outside applications . . . has solid experience in applying the cost and efficiency advantages of rope side frame conveyors to heavy duty overland conveying. Pre-engineered and pre-assembled trusses, including supports, walkways and covers, are available.



7

LONG-AIRDOX Roof Bolting Machines

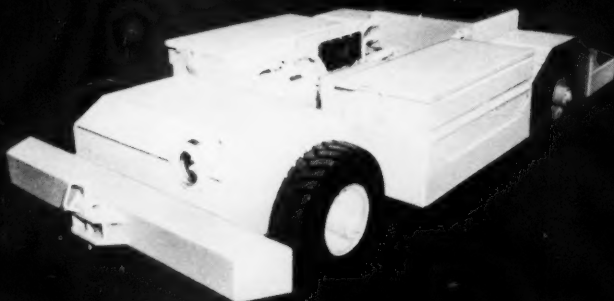
Long-Airdox offers a complete and varied line of LRB roof bolting machines for all coal mining applications in thick or thin seams. All have variable drilling speeds for all types of material; four-wheel drive, four-wheel steer which facilitates repositioning; and exclusive cyclone-filter dust collector that gives maximum efficiency for through-steel dust collection.



8

LONG-AIRDOX Battery Tractors

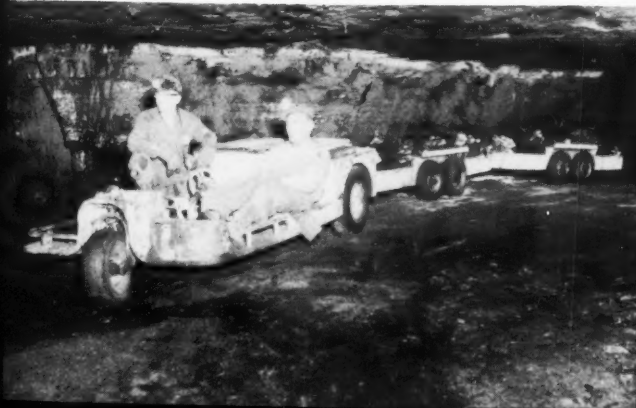
Available in both single or two motor units with two or four-wheel drive and two or four-wheel steer, these tractors are designed for heavy duty mantrip and supply haulage in high capacity trackless mines. They can pull trains of 5 to 10 trailers with men and/or supplies at speeds from 3 to 6 miles per hour. Trailers are available for all purposes.



9

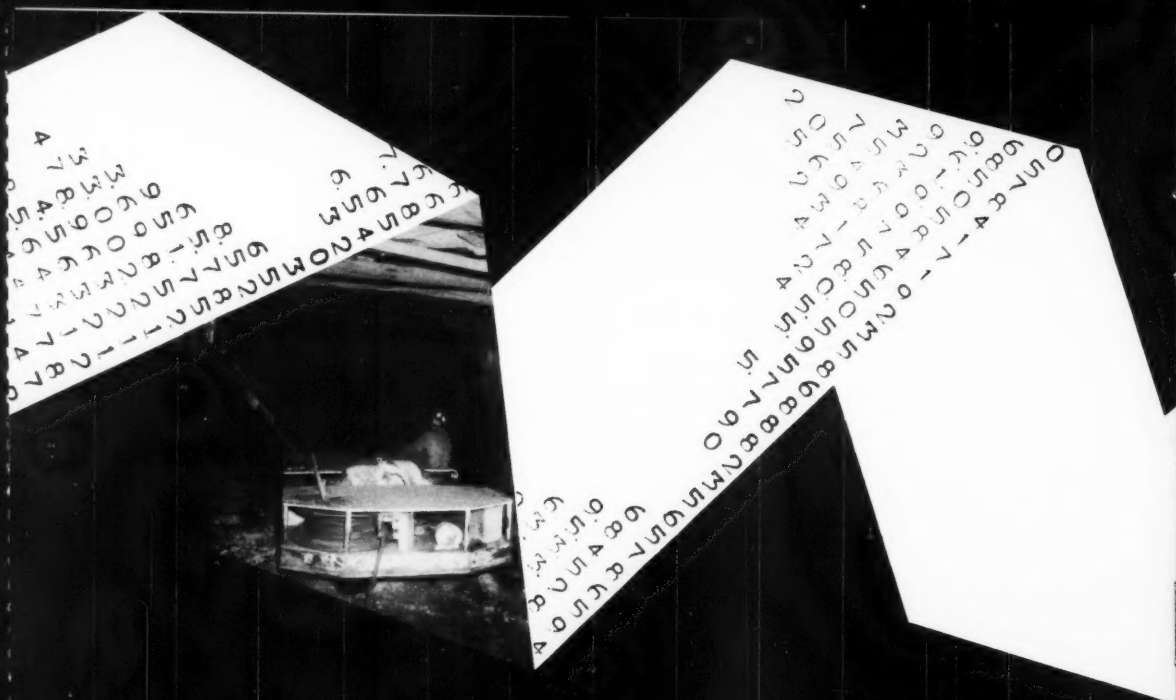
LONG-AIRDOX Inspector's Friend

This is an easily handled, battery-operated utility vehicle for personnel and supply handling on the working section. Primary applications are: general supply service; traveling between belt drive unit and face; transportation of supervisory personnel; supplying breakdown items to face during working cycle; assisting in rock dusting; etc.



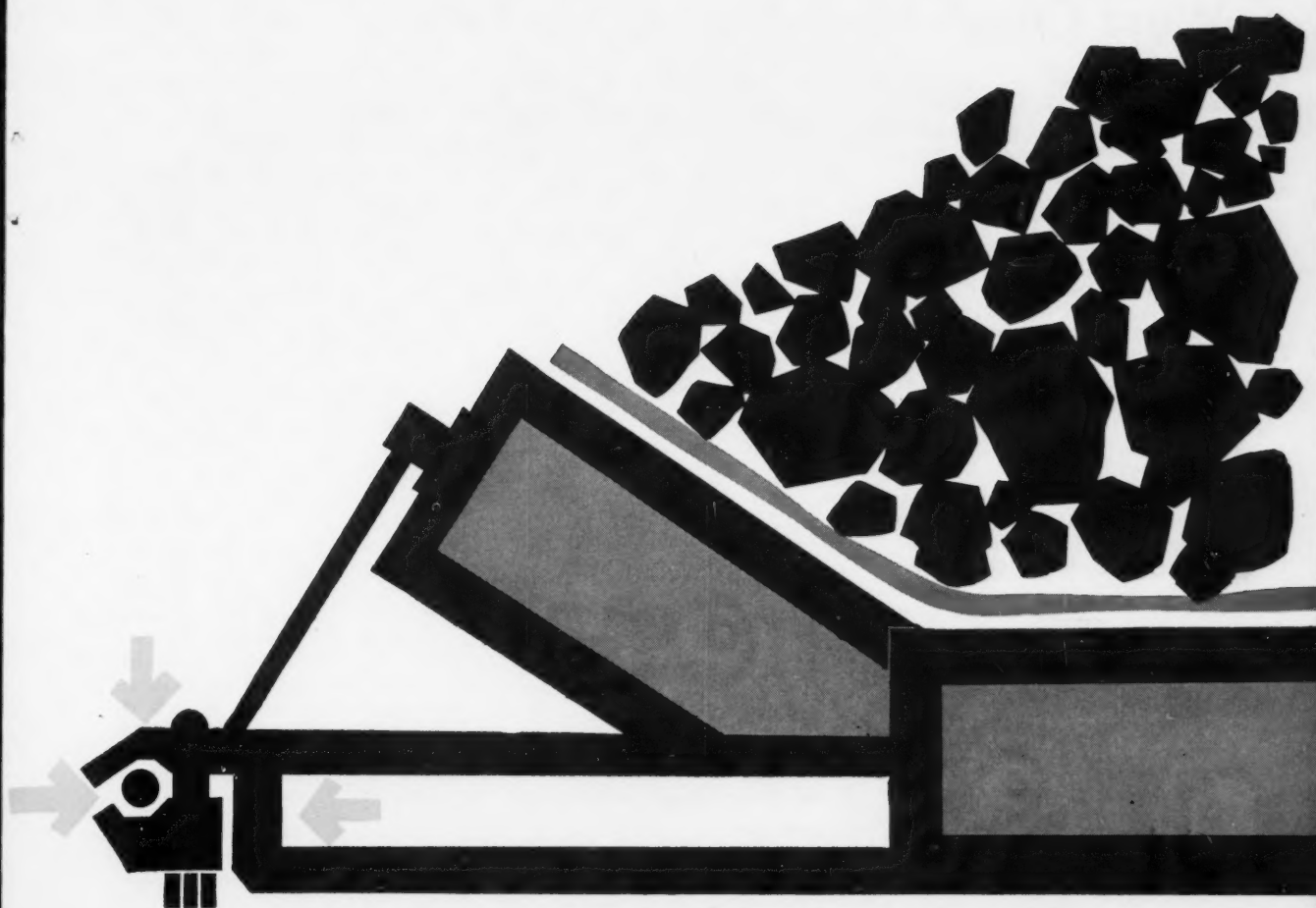
Other LONG-AIRDOX products for efficient mining and conveying

Shuttle car elevating conveyors • Mobile chain conveyors • Piggyback conveyors • Auger miners • Vertical and horizontal surface drilling machines • Augers of all types • Carbide mining tools • "Rosco" feeder-breaker machines.



9 ways to cut production costs...

LONG AIRDOX COMPANY • DIVISION OF MARMON-HERRINGTON COMPANY, INC. • OAK HILL, W.VA.



WHO ORIGINATED THIS BETTER BELT CONVEYOR?

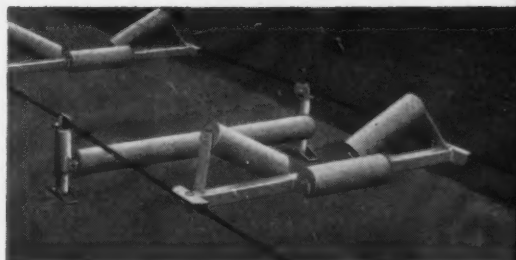
LONG-AIRDOX did— just as they have pioneered so many other major advancements in coal mining equipment and methods.

This LONG-AIRDOX development, the "Lo-Rope" belt conveyor,* differs from old fashioned designs in that *the idlers mount on top of the rope side frames and are self-aligning*. Some of the proved advantages of this construction are: belts stay centered as belt motion tips the idlers in direction of travel; conveyor stays aligned—rocker support stands can't walk out of position; fixed deep troughing angle centers load better and increases belt capacity; ropes are completely out of the way, making it safer to handle men and supplies; and belts last longer because they can't be cut by hanger stands.

For more information detailing how you can move more coal more profitably with "Lo-Rope" belt conveyors, write the Long-Airdox Company, Division of Marmon-Herrington Company, Inc., Oak Hill, W.Va.

*U.S. Pat. No. 2,896,774

LONG-AIRDOX



News Roundup

West Coast—New Market for Coal

Prospects for the substantial use of coal on the Pacific Coast, and particularly California, were considerably brightened as a result of developments in the past few weeks.

The fact that coal could become an important fuel within a few years for cement manufacturing and electric generating plants in southern California was testified to by the head of the University of Southern California's geography department, Dr. John W. Reith, associate professor.

The increasing cost of oil and natural gas and the constantly expanding demand for power are pushing southern California back to the use of coal as an energy source, Dr. Reith noted.

Because anti-smog laws would prevent burning coal in Los Angeles, the USC geographer predicted its use in cement plants in Riverside and San Bernardino counties which are exempt from smog control regulations due to their location. Although these plants do not now use coal, they may within a few years since the price of coal is remaining stable whereas the price of gas and oil is increasing. "Price is the main criterion determining the fuel used in southern California cement plants . . . and the

cheapest fuel will be used," he noted. "There are also certain technical advantages in using coal as a heat source because the fly-ash adds to the product."

To serve "anti-smog" Los Angeles, Dr. Reith foresees an electric generating plant in Utah utilizing economical "coal-by-wire" delivery. In addition to Utah, serious consideration is being given to high-quality coals of western Washington, British Columbia and Alaska. These could be delivered to Los Angeles by barge.

A deficit in locally available sources of fuel and power in southern California has arisen in the past 10 yr, noted Dr. Reith. "Whereas this region was once one of the nation's great energy surplus areas, it is now importing natural gas from Texas, petroleum from the Middle East and there is even a plan under discussion to bring hydroelectric power from the Columbia River to Los Angeles. The search for additional sources of energy is constantly going on and that is why interest is being shown in the basic fuel of the industrial revolution—coal."

Another reason for optimism arises out of the search of Western coking plants for a higher-quality coking coal. They see a possible solution to certain prob-

lems in a blend of Eastern coals with Western coals.

Transportation the Key?

One answer may lie in an unprecedented transcontinental shipment plan utilizing a railroad and a barge line. This cross-country plan was conceived by the Ohio River Co. and the Norfolk & Western R. R. The coal would be hauled by N&W lines to Kenova, W. Va., and then transferred to a barge which would carry it down the Mississippi to a Texas port and railroad terminus. The rest of the trip would be completed by rail.

David K. Sheeny, Ohio River president, said if the agreement is allowed, a half million tons could be shipped annually to the West Coast from West Virginia. Shipment under this plan would be about 25% cheaper than any other available method of shipping coal across the country, according to Mr. Sheeny.

Two other proposals for transporting the coal across country have been suggested. The first would have the coal transported through Hampton Roads and then shipped by collier through the Panama Canal to the West Coast. The second alternative would involve transportation of the coal entirely by rail.

Oil Imports Highest Yet

Residual fuel oil imports in the 4-wk period ending March 31 were 13% higher than in any like period in the past, the American Petroleum Institute reported. Imports averaged 881,000 barrels a day, up 32,400 a day from the previous high set in the 4-wk period ending Feb. 17.

No doubt this increase can be attributed to the additional allocation of 100,000 barrels a day granted by the Interior Dept. last February. With allocations for the second quarter of 1961 increased from the comparable period last year, record import levels are expected to hold.

Disagreeing with coal industry claims that reduction of residual oil imports would substantially increase coal sales was Oil Imports Administrator L. F. O'Connor. Appearing before a House Appropriations Subcommittee, he said that only "between 50,000 and 80,000 barrels daily of residual fuel oil actually

replaces coal—not replaces coal, but is sold in competition with coal, where you can burn whichever is more appealing economically at the time."

Railroads Buy Coal Barge Line

A contract for joint purchase of the assets of Island Creek Fuel & Transportation Co., a coal-hauling barge line operating on the Ohio River, has been signed, subject to approval by the Interstate Commerce Commission.

The two railways making the purchase—Norfolk & Western and Chesapeake & Ohio—will pay about \$4 million each for properties of the wholly-owned subsidiary of Island Creek Coal Co.

Both roads noted a sizeable increase in recent years in coal moved over their lines for transshipment at Ohio River ports but because both railroads are short-hauled, could participate in only a small portion of the total transportation. By this transaction, the N&W and C&O

will be able to participate in the total movement of coal which is tied by economic considerations to river transportation.

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**SPEEDY
DELIVERY
FROM
STOCK...**



In the market for carriage bolts? We make a full line of sizes. Lag and machine bolts also. And they're all top quality.

BE SURE TO VISIT US
AT THE
COAL SHOW
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BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Sales: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Interior Secretary Stewart L. Udall Visits West Virginia Mines

Interior Secretary Stewart L. Udall donned a pair of coveralls and a miner's cap April 12 for his first visit to an underground coal mine at the invitation of Senator Robert C. Byrd (D-W. Va.).

The invitation to visit West Virginia coal mine properties was extended to other Interior Department officials as well as Senator Jennings Randolph (D-W. Va.); Stephen F. Dunn, NCA president; Stuart T. Saunders, N&W president, UMW representatives and others. Trip arrangements were made by the National Coal Association in cooperation with the Norfolk & Western Ry. Co. West Virginia Governor W. W. Barron greeted the party in Bluefield and accompanied the group part of the day.

First stop was the No. 3 mine, Pocahontas Div., Cannelton Coal Co., at Superior, W. Va. Paul Morton, Cannelton president, took the group underground to observe modern mining techniques. Next on the agenda was the Page mine of Page Coal & Coke Co., where Warren F. Leatherman, Page president, was host for luncheon. During the afternoon the group visited U. S. Steel's coal cleaning plant at Gary, W. Va.

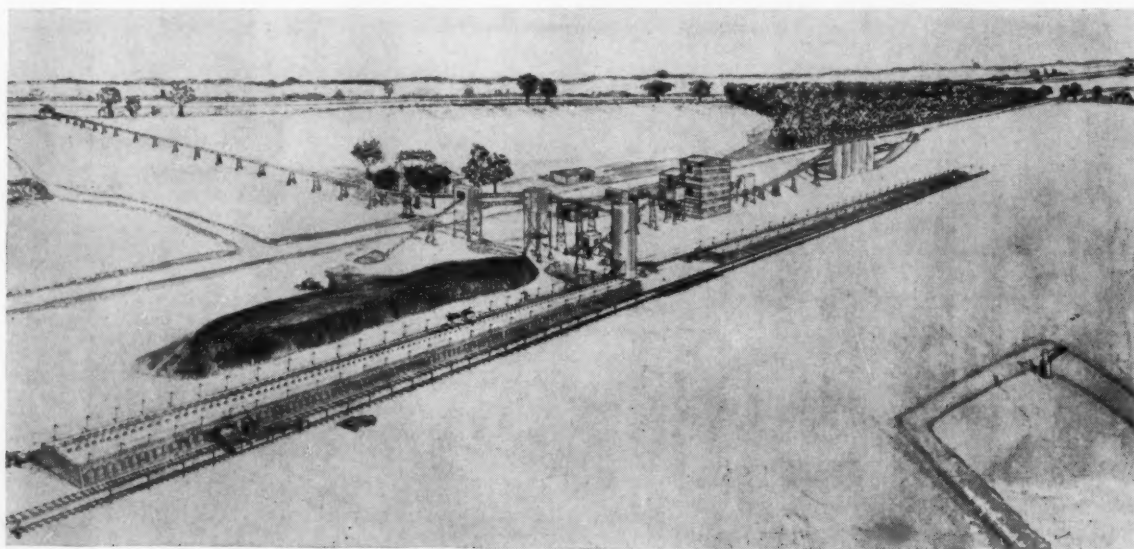
Winding up an eventful day the party enjoyed a reception at the Bluefield Country Club arranged by the NCA. In honor of the Secretary's visit, a "Stewart L. Udall Scholarship Award," to be established at the University of West Virginia, was announced during the reception. The scholarship will be offered to a West Virginia high school graduate interested in a mining engineering course. Secretary Udall said the establishment of the scholarship alone made his trip worthwhile and that he planned to contribute to the scholarship fund a "modest sum" he is to receive from a magazine article he has written. He described his tour as "exciting . . . profitable . . . sobering and enlightening." He paid tribute to the coal industry for its productive efficiency, management-labor cooperation and "guts . . . you put your shoulder to the wheel and go to work." Questioned by newsmen about his recent decision to increase residual oil import quotas, Mr. Udall said he would run a "tighter administration" on residual oil and he thought "coal people are going to be pleased with what we do."

Senator Byrd said he was particularly pleased at the Secretary's visit since his duties probably are more directly con-

cerned with the coal industry and its welfare than most other high officials of the Executive Branch.

Speaking at the annual dinner of the National Coal Policy Conference April 4, Secretary Udall pledged the Kennedy Administration's backing of pending legislation to establish a national fuels study. He said: "We cannot in something as important as fuels and energy let policy be set by drift, or by default, because we need a policy which will take into account considerations, paramount considerations, of national security and of the health of our economy in order to set down a policy. And therefore we shall support before the Congress the legislation which is pending for a national fuels study because this is in the national interests . . . I assure you that the Administration will go just as far as we can in helping the coal industry to achieve its proper goals. Over the past two mo I have been tremendously pleased at the cooperation and advice I have received from the leaders of the coal industry."

President Kennedy, in a telegram read at the dinner, said "The coal industry obviously needs assistance . . . I am determined that we shall help."



NEW YORK MINING & MFG. CO.'S CHEMICAL COKE PLANT on the Tennessee River near Calvert City, Ky., has a capacity of 180,000 tons of coke a year. A 1,250-ft elevated conveyor delivers coal to the plant from barges. As of March 21, 150 ovens were in blast and it is expected that all 200 ovens will be in full blast by the beginning of June.

IN THE PIT—a dependable 966 works 24-hour days at the new Banner Mine. At the United Electric Coal Companies' direct plant-to-barge mine in central Illinois, the 140 HP Traxcavator with bulldozer cleans up around the 45 yd. stripping shovel, cleans off the coal bed, shoves coal to the loading shovel, maintains the pit and does utility work all over the plant. Here in this brand-new, high-production mine, Traxcavator speed, easy operation and dependability pay off big.



TRAXCAVATORS speed production in coal pits and plants

FAST, SAFE AND BUILT TO LAST—The Power Shift Transmission and single lever forward-reverse cut seconds off cycle time. Automatic bucket positioner and kickout combine to make Traxcavators fast-working production machines. Operators find that getting on and off Traxcavators is easier than getting in some automobiles: there's a wide-open compartment, excellent visibility, lift arms up in front. Dependable Cat Diesel Engines assure plenty of power with low operating cost. See your Cat Dealer to learn how wheel-type and track-type Traxcavators—six in all—can help keep production moving on schedule.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

IN THE PLANT—The 966 is productive as well as versatile. The 4 yd. light material bucket for the 966 makes it a high-production coal feeder for a smaller utility plant or an ideal general purpose and clean-up machine around a bigger plant. Its speed and maneuverability—turning radius is under 21'—make it a nimble worker in tight quarters. A variety of attachments for the 966 fit it out for many jobs—bulldozers, side-dump buckets, snow plows, special material buckets, etc. You can set production or utility requirements and fill them ... with a 966 Traxcavator.



People in Coal



Young Executive Steps Up

EDWARD BARNES LEISENRING JR. moves up to the posts of president and chief executive officer of the Virginia Coal & Iron Co., Stonega Coke & Coal Co., Westmoreland Coal Co. and Westmoreland, Inc. These positions were vacated April 1 by retirement of R. H. Knode who will continue as a director and chairman of the executive committees of the companies.

Born in Bryn Mawr, Pa., in 1926, Mr. Leisenring received his education at the Episcopal Academy in Philadelphia and Hotchkiss School, Lakeville, Conn., from which he graduated in 1944. He spent 1944 to 1946 in U.S. Navy aviation and in 1949 graduated from Yale University with a B.A. in English.

His coal career started in 1949 with Stonega Coke & Coal Co. where he held various jobs in the mines from general labor, as a member of the UMWA, to mine superintendent. Four years after his move to the Philadelphia Office in 1952, he was elected vice president of the four coal companies associated with his most recent promotion. He became president of Stonega and executive vice president of the other three in 1959.

Other positions held by Mr. Leisenring include chairman of the board, General Coal Co.; president and director, Wentz Corp.; and a director of Fidelity-Philadelphia Trust Co., Whitehall Cement Mfg. Co., Jeddo-Highland Coal Co. and Bituminous Coal Operators' Association. A trustee of Lankenau Hospital and the Institute for Cancer Research, he was elected a director of the Southern Railway Co. last March 28.



John G. Partch has been appointed to the new post of director, chemical development, Research and Development Dept., North American Coal Corp. He will be active in the company's plans for diversification into the chemical industry and in marketing products related to the aluminum sulphate plant now under construction at Powhatan Point, Ohio. (*Coal Age*, April, 1961, p. 40). Holding degrees in chemistry from Miami University and Western Reserve University, Mr. Partch comes to North American after 17 yr with Standard Oil Co. (Ohio) where he was a supervisor in the Commercial Development Div.

Eastern Gas & Fuel Associates announces personnel changes: **L. J. Lowell** has retired as general sales manager, Coal Div., with these responsibilities being assumed, for the present, by **Harold J. Spear**, vice president in charge of sales. **R. L. Llewellyn**, formerly preparation engineer, has been named manager on preparation, Engineering Dept., Coal Div., and will also have general supervision of the Product Control Dept. **Edgar Nash**, formerly preparation engineer, High Volatile Coal Div., has been promoted to product control manager, replacing the late **James C. Johnson**. **Curtis L. Burgess** has progressed from general inspector to product control supervisor, High Volatile Div. In the firm's Low Volatile Coal Div., **Joseph T. Heatherman**, former division preparation engineer, will be product control supervisor and **Joseph C. Basile** rises from preparation engineer to product control supervisor for the company's northern division.

G. Albert Shoemaker, president, Consolidation Coal Co., was elected a director of the Norfolk & Western Ry. and a member of the board's Finance Committee. Mr. Shoemaker had been employed by Union Collieries when that firm merged with Consolidation in 1943 and he became vice president of its Renton Div. In 1948, following merger of Pittsburgh Coal and Consol, he was made vice president, then president of

the Pennsylvania Div. In 1951 he was elected vice president and in 1952 executive vice president of Pittsburgh Consolidation Coal Co. He was named a director in 1956 and Consolidation's president in 1960.



Charles B. Lakin became president of Berwind-White Coal Mining Co. and New River & Pocahontas Consolidated Coal Co. for the ensuing year effective March 30, 1961. He had been executive vice president and chief executive officer of the two firms. Joining Berwind-White in 1932, he remained there until 1943

(Continued on p 38)

STOP... and consider the important cost, safety and speed advantages of **NATIONAL** vertical load suspension devices.

successfully in new car designs. These designs are fully proven, equipment upgrading programs. life, minimizes spillage, provides

① narrow gage cars fully adaptable for Correct vertical greater personnel

② narrow body cars use in new rolling load suspension safety, and speeds

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Mine Sales • Transportation Products Division



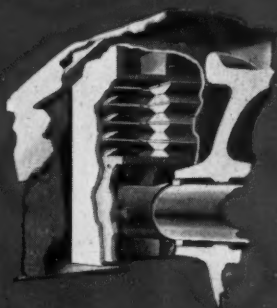
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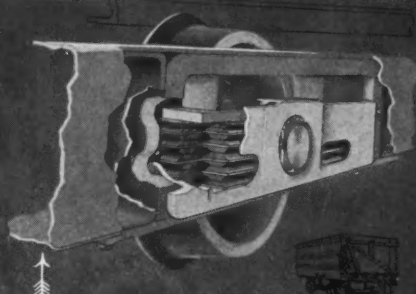
NATIONAL
MALLEABLE AND STEEL
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COMPANY

Cleveland 6, Ohio

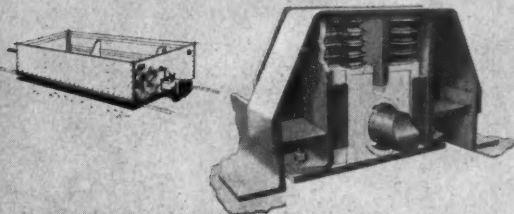
NC-1 MINE CAR TRUCKS • RUBBER CUSHIONING DEVICES • NACO STEEL WHEELS
NACO STEEL LINKS & SWIVEL HITCHINGS • WILLISON AUTOMATIC COUPLERS



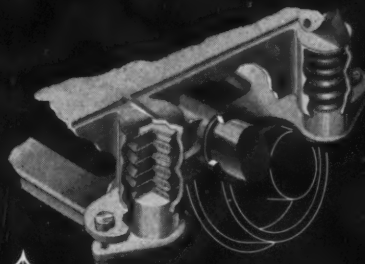
① National MI-245 rubber units, for 4-wheel rotary dump car, minimize vertical oscillation of cars through high absorption characteristics.



② Twin National MI-235 units used on each side of the axle center line and outboard of the wheels.



③ Twin National MI-240 units used on each side and over the axle inboard of the wheels.



④ Twin National MI-240 units, used in narrow body cars, are located in line with wheels to eliminate side overhang.

**"Our TD-25's *deliver* 25%
than the '24's' they**

—Tommy Belville, for *Belville Mining Company, Inc.*,



more load replace"

Ironton, Ohio



"Our three International TD-25's are delivering 25% additional load, compared with previously-owned TD-24's," reports Belville Mining Company, Inc. "The TD-25 has more power to work at faster speeds without loss of motion."

"Another big advantage of the TD-25, mighty important in outcrop cutting, is you can back it up extreme grades at the faster speeds without changing gears."

"Belville" teams "25's" with a 7-cu yd dragline and a 2½-cu yd stripping shovel—to remove overburden as deep as 60 feet. The tractors are also used to level for the shovels, clean coal, construct roads.

"Live track" power-steering!

Like the TD-24, the TD-25 gives you exclusive "live track" Planet Power-steering—to make full-load, full-power turns, or slam straight ahead with offset loads. With combined on-the-go, HI-Lo power-shifting, you get instant, up-or-down matching of power to condition.

You turn with the dozer fully loaded, without spillage. You get constant-contact benching or highwalling, applying full power, getting full speed. You eliminate "dead-track drag" and "gear-shift lag"

With exclusive new International DT-817 Diesel engine wallop, the "25" bulls along, 230 turbocharged hp strong—without "slow-motion" lug-downs. New TD-25 seven-roller tracks are strength-matched to full engine effort. And the "25" is platformed on super-rugged double-box-beam frames to meet slam-bang conditions!

See what it means in extra profits to beat the famous TD-24 by 25% or more. Compare planet-drive "25" ability to outearn king-size clutch-steered rigs by amazing margins—clearing land, blading rock, benching, mass-production overburden removal. Let your International Construction Equipment Distributor demonstrate.

Benching an access road on a 1-to-1, or steeper, mountain slope. The operator of this Belville-owned TD-25 takes maximum advantage of "live track" Planet Power-steering—to gouge out stumps and boulders and cut shale—without "bank-nosing" or sluing. He simply operates the bank-side track in high-speed range, the other in low-speed range—for full-capacity, straight-ahead performance.

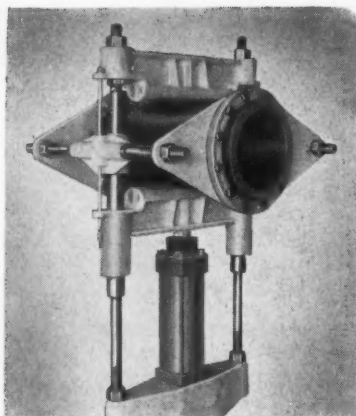


International[®] Construction Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Illinois
A COMPLETE POWER PACKAGE

Two of "Belville's" TD-25's remove up to 50% of the overburden from a coal seam—produce 25% more than the "24's" replaced. Only simplified TD-25 planetary design gives you "live track" power-steering and on-the-go power-shifting.





AUTOMATED Hydral-60 PINCH VALVE SYSTEMS

**Controlled circuitry
for any operating
requirements**

- The Massco-Grigsby Hydral-60 System consists of one or more pinch valves with a single automatically operated hydraulic pump.
- Hydraulic pump may be operated by electric motor or by air from normal plant supply system.
- Valves may be the same or different size.
- Valves in the system may be operated simultaneously or independently.
- Control valve may be manual or solenoid.
- Valves may be coordinated and interlocked with other plant equipment to automatically control tank levels, rate of flow, etc.
- Valves are self-supporting and may be operated in any position from horizontal to vertical.
- Valves may be independently controlled for normal or rapid closure.
- Valves may be held fully open, fully closed, or at intermediate positions.
- Remote control to meet individual requirements.
- Controls may be included for automatic emergency operation.
- 3" to 14" I.D. sizes, with 50, 100, and 150 psi line pressure ratings.
- Temperatures to 200° F.

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Manufacturing Division

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OFFICES AND AGENTS IN PRINCIPAL CITIES



People (Continued)

when he enlisted in the U. S. Army where he rose to the rank of First Lieutenant. After his discharge in 1946, he rejoined Berwind-White and was appointed a vice president in 1956.

In addition, Berwind-White Coal Mining Co. and New River & Pocahontas Consolidated Coal Co. announced the following appointments applying to both companies: C. E. Dunlap, honorary chairman of the board; E. J. Behn, chairman of the board, C. G. Berwind Jr., vice president; J. J. Sellers, Comptroller, R. D. Anderson, secretary and F. Pattison, assistant secretary. Other appointments for Berwind-White include L. A. French, vice president; T. J. Willing, vice president-sales; D. Atkinson, treasurer, and F. Pattison, assistant treasurer. New River also elected Z. H. Herndon, vice president-lands; J. J. Sellers, treasurer; W. M. Buck and H. R. Schnell, assistant treasurers.

David L. Francis, president, Princess Coals, Inc., has been named vice president, southeastern division, United States Chamber of Commerce. He will serve a one-year term which started May 2.

Recently appointed to the enlarged and reconstituted National Advisory Committee on Community Air Pollution was R. L. Ireland, chairman, executive committee, Consolidation Coal Co.

R. E. Sachs, president, Lehigh-Boone Coal Co., succeeds W. S. Heil as a vice president, Lehigh Coal & Navigation Co. Mr. Heil resigned as of March 27.

Joseph M. Richards was named vice president of operations, Blue Diamond Coal Co. Mr. Richards first worked for Blue Diamond during the summers of 1947 and 1948 while a student at the University of Kentucky. Upon graduation he was employed as an engineer at the

Leatherwood mine and in 1951 was transferred to the Engineering Dept. in Knoxville. In 1956 he was made assistant general manager of mines and general manager in 1959. His family has been associated with the company since it began operation in 1915.

Other Blue Diamond officers re-elected were Gordon Bonnyman, president; Joseph H. Hoffman, vice president-sales; L. M. Rayburn, vice president-stores; Robert Watson, secretary-treasurer; and James R. Love, assistant to the president.

Paul Weir Co., Inc., engineering-consultant firm, Chicago, recently delegated two teams of mining specialists to South Vietnam and Turkey to assist those countries in their coal mining operations.



Price



Wickey

Harold L. Price, party chief for the South Vietnam project, was formerly superintendent of operations for Glen Alden Coal Co. He also served as president, Price Coal Co. and treasurer, Eagle Hill Contracting Co. In addition, Mr. Price has been an independent consulting mining engineer in Hazleton, Pa., for 8 yr.

Heading up the team in Turkey is Harold B. Wickey who has served the coal mining industry for more than 25 yr. He started in 1934 as an engineer in West Virginia fields and served with the Coal Mining Div. of the War Production Board during World War II. A former instructor at West Virginia University Extension School, Mr. Wickey had been operations vice president for Pennsylvania Coal & Coke Co., Lehigh Valley Coal Co. and Glen Alden Corp.

(Continued on p 64)

CONTRACT CORE DRILLING

EXPLORATION FOR MINERAL DEPOSITS
INCLUDING URANIUM & LIMESTONE — ANYWHERE

FOUNDATION TEST BORING • GROUT HOLE DRILLING

**Skilled crews and complete stock of core drills
and accessory equipment maintained at all times**

Core Drill Contractors for more than 60 years

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MANUFACTURING CO.

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MICHIGAN CITY, INDIANA

Coal Abroad

Japanese Steelers Eye W. Va. Mines

An American offer to lease two West Virginia coal mines is presently under study by a group of Japanese steel companies. The two mines are the Havaco and Capel properties of the New River & Pocahontas Consolidated Coal Co. in McDowell County. They were first brought to Japanese attention last fall by Dr. Huston St. Clair, president of Jewell Ridge Coal Corp., Tazewell, Va., which has sold coal to Japan in the past.

Included in the group are the Yawata Iron & Steel Corp., Fumi Iron & Steel Co., Nippon Steel Tube Co. and others. Tadayoshi Yamada, head of Yawata's Foreign Div., said a decision would be made after evaluation of a report being prepared by the Japanese mission that recently visited the mines.

Japan's steel industry must import a considerable quantity of high-quality coking coal which cannot be produced abundantly in Japan.

New Member for Common Market

The Commission of the European Economic Community recently signed an agreement for association with the Greek Government. This association, which will take the form of a customs union between Greece and the EEC, is intended to enable Greece eventually to become a full member of the community.

OVERSEAS FLASHES

GREAT BRITAIN—In the most ambitious U. K. mechanization program ever launched, Britain's National Coal Board plans installation of 400 coal cutting and loading machines in the pits this year. At year's end almost half Britain's saleable coal output will be produced mechanically. Aim is to boost productivity and cut production costs, thus enabling coal to compete more effectively with oil.

"Recent but rapid" describes progress in power-loading of coal in Britain. In 1950 only 3.8% of total tonnage was won entirely by machine while last year the proportion jumped to 38.2%, or 83 million long tons. The board hopes to raise the figure to 48% this year.

Greater concentration on production

designed to obtain a better balance between coal-face capacity and support services will accompany mechanization efforts. Introduction of machines will extend production from the present one shift to two or three shifts.

WEST GERMANY—Concern over critical competition from oil and gas moved German mine owners to seek sales of their coal through a single sales syndicate agency. Hearings are expected to commence this month by the Arbitrations Court of the European Coal & Steel Community.

The single syndicate would be able to levy penalties on mines exceeding allotted production quotas and could subsidize mines unable to meet quotas.

Leading coal men, however, see little chance for approval of their application for a single syndicate. They expect the ECSC will clamp down tighter on the three existing sales organizations to hinder their present close cooperation. At the hearings, the Ruhr mining concerns will try to get the proceedings suspended until such time as a workable solution can be found.

Now fully

AUTOMATED PREPARATION PLANTS

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Heavy Media Separation of Coal Using Wilmot Specific Gravity Control System — Holds Media Density within $\pm .003$.

Wilmot Hydrotators, Classifiers and Froth Units with Fully Automated Wilmot Controls.

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RAIL WELDING
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NO EQUIPMENT

Newest development in rail welding is the Thermit Self-Preheat process—simplest of all welding methods.

There's no costly equipment to buy and haul in and out of the mine. Materials required come in kits. Each kit contains everything needed to make one weld.

And, because preformed molds are used and preheating of rail ends is unnecessary, you can actually make a rail weld in less than fifteen minutes

Write for detailed information.

THERMIT RAIL WELDING

Thermex Metallurgical, Inc., Lakehurst, New Jersey

10-yard P&H 1855 long range dragline is the largest excavator mounted on a single pair of crawlers. Unmatched for maneuverability and speed for draglines of such long booms and large buckets. Equipped with Magnetorque drive for drag and hoist as well as swing and propel motions.



3 1/2-yard P&H diesel excavator features long crawlers and Magnetorque drive for swing and propel motions. Equipped with 48-ft. boom and a 34-ft. dipper handle for economical stripping operation.



This 15 to 18-yard P&H coal loader with Magnetorque drive delivers up to 25% faster operating cycles. Combines long reach with unusual mobility. Choice of boom lengths up to 70 ft. and dipper handle lengths up to 56 ft.




1 1/2-yard P&H excavator loads coal into trucks. Exclusive P&H Magnetorque drive for swing and propel motions delivers the smoothest, fastest, most accurate swings and "move ups" known in the industry.



4 1/2-yard rugged P&H Dragline with long crawlers for extra stability handles up to 80 ft. boom. Equipped with Magnetorque drive for swing and propel motions. Delivers fastest swings in the industry.

It pays to standardize on P&H...

P&H WITH MAGNETORQUE® DRIVE GETS DOWN TO COAL FASTER... LOADS IT OUT QUICKER



It's good business to standardize on P&H electric shovels and draglines, diesel excavators and truck cranes for all your needs . . . big, medium or small . . . There's a size and type for every job.

Full-Electric and Diesel-Electric Shovels and Draglines from 3½ to 10 yards—Big, rugged electrics that deliver up to 10% more production with exclusive MAGNETORQUE drive—the most productive work-motion drive known for mining excavators. The system that electro-magnetically transmits driving energy of the power plant (A.C. electric motor or diesel engine) direct to the work motions, without intermediate conversion to D.C. current.

Diesel Excavators from ½ to 4 yards—Workhorse machines that pay for themselves fast with increased production . . . higher job availability. Among the various models you find important bonus features—such as: Magnetorque—powered swing that delivers the fastest, smoothest swing

motion in the industry . . . Sealed Power Box design with all gears running in an oil bath, completely sealed from dust and dirt for trouble-free, maintenance-free operation . . . Quick, on-the-job convertibility from shovel to dragline service.

Versatile Truck Cranes from 12½ to 80 tons—Highly maneuverable, powerful truck cranes that keep your big crawler excavators free for production . . . Mobile units ideally suited for handling secondary road-building, refuse disposal, drainage, erection, maintenance and 101 utility jobs. . . . Truck cranes that can be changed in the field to any front-end attachment quickly, easily and without special tools.

See for yourself why more mines today are standardizing on P&H equipment. There is a reason . . . Harnischfeger offers you more advanced designs, new concepts in engineering that pay off in increased production and lower operating costs.

Compare before you buy—write today for more information.

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How

THE BROAD H-R LINE

*can pinpoint
your needs,
save you time
and give you
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savings.*

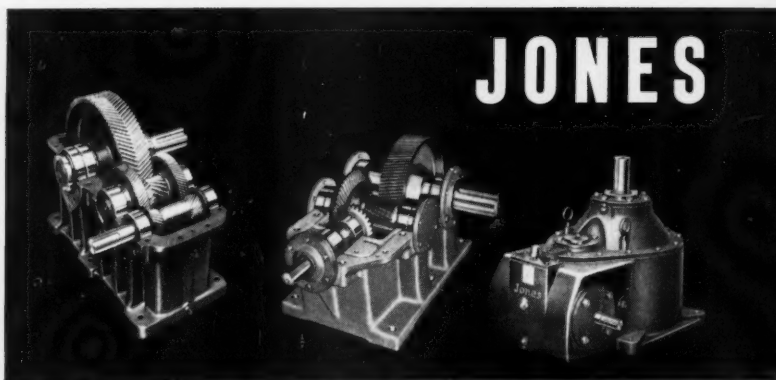
YOUR H-R POWER TRANSMISSION SPECIALIST CAN SHOW YOU HOW...

to select the ratio, capacity, and design closest to your needs . . . directly from H-R standard equipment . . . and at "off-the-shelf" savings.

Another point in your favor: your H-R power transmission specialist is in the best position to help you

select the right drive. He can recommend without bias, because the H-R line is one of the most comprehensive in industry. Experienced in *all* phases of power transmission, he can be invaluable in helping you with your over-all drive problem. Important too, he has Hewitt-Robins service and reliability behind him!

Availability? H-R warehouses, sales offices, and stock-carrying distributors spread a strategic network from Coast to Coast. There is a team of H-R



JONES

Jones herringbone reducers...

Ruggedness and reliability, known throughout industry. Widest selection of sizes and ratios. Balanced design, rugged housing, heavy-duty bearings mean efficient, trouble-free operation, and longer life. Capacities to 1,672 hp. Bulletin J-100.

Jones spiral bevel speed reducers...

Most-up-to-date design. Horizontal or vertical outputs. New, highly efficient right angle drives. Matched sets of high-hardness spiral bevel gearing, oversize bearings, alloy steel helical gearing. Capacities to 1,050 hp. Bulletin J-25.

Jones worm helical speed reducers...

Heavy duty service. Applicable to a wide range of vertical drive requirements where medium to high speed reduction ratios are needed. Available in low speed shaft extension up, down, and double extended. Capacities to 175 hp. Bulletin J-14.



UNION

Union ASA standard roller chain...

Over 98% efficient. Union ASA standard roller chain transmits more horsepower in less space than many other mechanisms. Available in outstanding range of pitches and widths, ASA standard and ASA heavy series, and extended pitch. Bulletin RT-60.

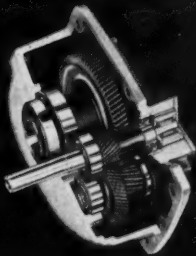
Roller chain attachments...

An almost unlimited variety of unusual drive and conveying problems can be solved with standard or special attachments by Union Chain. Bulletin RT-60.

Union roller chain sprockets...

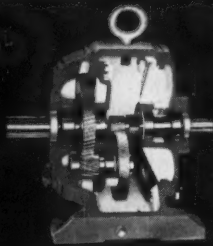
Complete range of stock and special sprockets for all chain applications. Precision teeth, tough, durable body, proper tooth surface hardness make for long life and economy. Available also in Taper-Lock bushings. Bulletin RT-60.

SPEED REDUCERS



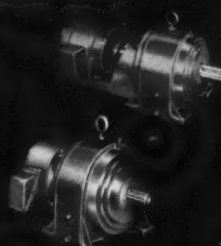
Jones shaft-mounted reducers ...

Compact design for confined areas. High hardness gearing for long life. Double lip oil seals, anti-friction bearings, automatic overload mechanism, positive lubrication. Torque-arm for simple belt tensioning adjustment. Capacities to 40 hp. *Bulletin J-19.*



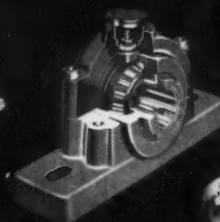
Jones in-line helical reducers ...

Standardized components, both in-line and right angle reducers to meet any drive requirement. Easy-to-change ratios. One-piece, cast housing, positive gear and shaft alignment, reliable oil-sealing. Capacities to 147 hp. *Bulletin J-18.*



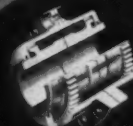
Jones gearmotors ...

Horizontal or vertical, flange or foot-mounted. Two basic types: *All-motor* ... has motor mounting bracket for foot-mounted motor. *Integral* ... incorporates flange-type motor bolted directly to gearhead housing. *Bulletin J-17.*



Jones power transmission components ...

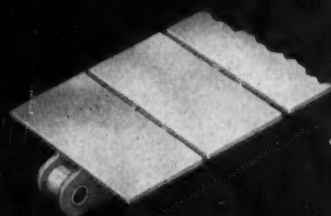
Pillow blocks for heavy-duty service. Timken tapered roller bearings, two-piece, cast iron housing, shaft sizes from 1 15/16" to 9". Flexible couplings, gear tooth, fabric disc ... *V-belt drives* ... cast iron pulleys. *Bulletins J-10A, J-16, J-23.*



Jones complete drive units ...

Safe, efficient special drives, feeder tables, car pullers, door, boom, and skip hoists. Feature rugged reliability of Jones speed reducers. Standard lines available or modifications of existing equipment at considerable savings. *Bulletins J-11, J-22.*

CHAIN



Union ASA standard flat top roller chain ...

Now available in Delrin, (as well as other materials) reduces breakage and eliminates corrosion problems in many food, beverage, and pharmaceutical conveyor applications. Available in many combinations of chain and materials. *Bulletin RT-60.*



Union HB steel drive chain ...

At home in heavy duty service, such as cement mixers, cranes, shovels. Offset side-bar adds to flexibility. Hardened bearing for rugged wear. Pitches from 1.6" to 6.0". Average ultimate tensile as high as 420,000 psi! *Bulletin A-4.*

Union HB steel roller chain ...

Low ultimate cost in all types of elevating and conveying duty. Hardened alloy steel bushings, uniform wearing surfaces, true pitch accuracy, tight fit of pins and bushings. *Bulletin A-4.*

Union apron conveyors ...

Many types available. Union apron conveyors for bulk or packaged materials. *Bulletin A-4.*

Union "Made-to-order" chain ...

Meet unusual requirements. Union Chain Division of Hewitt-Robins, unlike many manufacturers, is able to design and produce special chains to meet special needs. *Bulletin A-4.*

power transmission specialists in your territory. To put them to work for you, just give your nearest Hewitt-Robins Sales Office a call.



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ENGINEERING SERVICES

----- WRITE FOR TECHNICAL BULLETINS -----

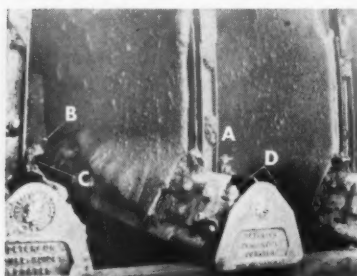
HEWITT-ROBINS
DEPT. 5-49, STAMFORD, CONNECTICUT
Gentlemen:
Please send me the following bulletins:

☐ J-10A ☐ J-11 ☐ J-14 ☐ J-16 ☐ J-17 ☐ J-18 ☐ J-19 ☐ J-23 ☐ J-25 ☐ J-100 ☐ RT-60 ☐ A-4

Signed _____ Title _____
Company _____
Address _____

A Sure Way To INCREASE Wire Cloth FILTER EFFICIENCY

Peterson's "Dual Guide"* scrapers discharge close to 100% of the filter cake (even with thin cakes) without tearing wire cloth. You gain a longer life for your wire cloth, a dryer cake, and up to 20% increase in the equivalent effective filter area! This means INCREASED FILTER EFFICIENCY.



Here are the reasons for these outstanding advantages. Guide surfaces are provided on the rim (A) and the heel (B) of the disc, aligning with the dual guides on the scrapers. These guides combined with the pin or hinge mounting in the rear of the scrapers (C) and the bar hinge in the front (D) allow the scrapers to follow any misalignment of the disc. Thus, a close, positive parallel setting is maintained at all times. Get the complete story on the "Dual Guide" Scrapers and the savings they can effect in your plant. Your present filter can be converted, or they are standard equipment on all Peterson Wire Cloth Filters. Write for Bulletin NO. D. G. - 104.

*Patented



Look for the sign of the Viking Mark Parts



PETERSON FILTERS
AND ENGINEERING COMPANY
P. O. BOX 606 • SALT LAKE CITY 10, UTAH

Current Coal Patents

Oliver S. North
Patent Research and Abstracting
Washington, D. C.

Method and apparatus for calibrating a belt conveyor scale, S. A. Jones (assigned to Consolidation Coal Co., a Corporation of Pa.), Mar. 14, 1961. Design for a device for intermittently calibrating a vertical displacement type scale used with belt conveyors that transport coal or other materials for the purpose of determining the total weight of material transported during a period of time. No. 2,974, 518.

Flotation of fine particles by starch ethers, C. G. Caldwell, O. B. Wurzburg and S. C. Sun (assigned to National Starch & Chemical Corp., a corporation of Pa.), Mar. 14, 1961. To improve the flocculation of fine mineral particles in aqueous suspension, a tertiary or quaternary amino alkyl ether of starch is added to the mineral pulp. No. 2,975,124.

Artificial fuel composition, M. L. Stuehler, Mar. 21, 1960. A clean, briquetted or pelletized artificial fuel for starting fires or for use in outdoor broiling or cooking consists of 1 part molten wax and about 2½ parts of anthracite coal ashes. No. 2,976,133.

Conveyor apparatus, D. D. Murphy (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Mar. 28, 1961. Improved mine conveyor apparatus having idler structures spaced longitudinally along a storage length of conveyor belting for supporting such belting and which are located outwardly adjacent the sides of the path of movement of a belt supporting carriage, the movement of which causes the idler structures to be displaced from their belt storage position. The belt can be automatically extended without affecting the conveying operation. No. 2,976,982.

Apparatus and method for wet screening, F. J. Fontein (assigned to Stamicarbon N.V., Heerlen, Netherlands), Mar. 28, 1961. In a process for wet screening coal fines on a sieve bend screen whereby separation of very fine sized particles is obtained without screen clogging, the underflow from a sieve bend is led over a following sieve bend with a smaller width of slot than the first, thus reclassifying the fine particles. No. 2,976,996.

Apparatus for pulverizing coal and the like, F. A. Fawcett (assigned to Bath Iron Works Corp., Bath, Me.), Mar. 28, 1961. Design for a coal pulverizer of the "Coalpactor" type that pulverizes

coal to a predetermined particle size by the impact reduction principle without the production of an excessive amount of fines. This pulverizer has breaker blocks which do not plug with wet coal. No. 2,977,055.

Continuous mining machine having roof fall receiving and conveying means, G. T. Felbeck, J. W. Heimaster and J. D. Newlon (assigned to Union Carbide Corp., New York, N. Y.), Apr. 4, 1961. Design for a conveyor means for receiving roof falls in remote-controlled bores and removing the fallen material from the mine during operation of the conveyor, thereby avoiding the hazard of sending men into the bore to clear falls. Fallen slabs are removed on a train of overlapping horizontal conveyors. No. 2,978,235.

Crawler mounted loop miner, J. F. Joy (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Apr. 4, 1961. An improved core cutting and breaking means is provided for a crawler mounted loop miner. The cutter is reversible, that is, it can be operated in right angled positions from either side of the machine. No. 2,978,236.

Installation for the transport of lumpy material, G. J. de Vooy and F. J. Fontein (assigned to Stamicarbon N.V., Heerlen, Netherlands), Apr. 4, 1961. Design for an apparatus for the hydraulic transport of lump coal or like material from underground workings of a mine to higher levels. The transport conduit is positioned in solid rock or a concrete-lined shaft, whereby a part of the stresses caused by the very high pressure used is absorbed by the rock. No. 2,978,278.

Rocker screen vibrating machine with undulated screen cloth, J. F. Cibula, Mar. 7, 1961. In an improved vibrating screen mechanism for classifying and dewatering coal or other granular materials, an undulated screen is used for directing the flow of material. The screen has a sinusoidal longitudinal contour and vibrates in a multiplicity of directions to effect a thorough screening and classification of the feed material. No. 2,973,865.

Mining and loading machine, N. W. Densmore (assigned to Joy Mfg. Co., Pittsburgh, Pa.), Mar. 7, 1961. A coal mining and loading machine is provided with an improved cutting and dislodging head embodying a combined drilling and core cutting means and a core breaker, and improved mechanism for driving those parts. The machine is compact, durable, and relatively low in height. No. 2,973,949.

O-B Designs for Mining Men



RESULT:

A circuit interrupter that costs less than

any other type of cable protection...

except the fuse!


MAGNA-TRIP SNUFFS OUT SHORTS BEFORE THEY HAVE A CHANCE TO CAUSE TROUBLE. Ingenious design by O-B engineers results in a simple sturdy unit to protect machines, cables, and men. This safe control-device drastically reduces the danger and expense of cable fires.

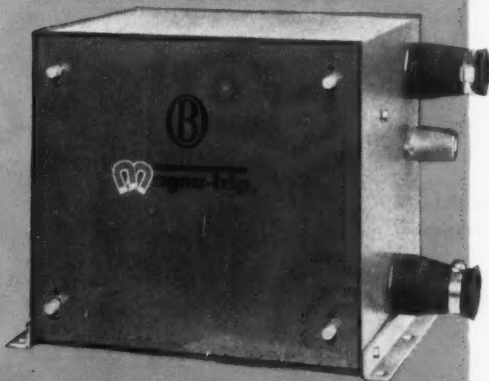
VITAL MINING MACHINES PRODUCE MORE WHEN THEY'RE PROTECTED WITH MAGNA-TRIP. This efficient unit reduces damage resulting from shorts and faults in cables. Less damage means less lost labor . . . less lost time . . . less lost production on your jobs.

WHEN IT TRIPS . . . THERE'S TROUBLE. Magna-trip has been designed to allow for normal surge loads without "false tripping." When Magna-trip kicks out . . . there's trouble on your circuit . . . and you've saved damage and delay!

PAYS FOR ITSELF WITH THE FIRST CABLE IT SAVES . . . ALL OTHERS ARE PROFIT. Magna-trips cost less than the ordinary length of cable that it protects. The first time that it saves a cable that would otherwise have been destroyed . . . you've paid for your circuit interrupter. In its lifetime, your Magna-trip will return to you its cost many times over.

OHIO BRASS COMPANY, MANSFIELD, OHIO, Canadian Ohio Brass Company Ltd., Niagara Falls, Ontario.

 Magna-trip keeps big machines moving . . . saves cables . . . protects equipment. Units are available in 100- and 300-ampere sizes for 250 or 600 volt circuits . . . All are compact, sturdy, reliable.



Ohio Brass 

EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY
AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS

HOLAN



INCREASING PRODUCTION—J. F. Core, U. S. Steel Corp., explains how continuous mining has affected production methods. Ralph Whitman, Ingle Coal Corp., Elberfeld, Ind., presided at the sessions. Michael Kensek, Enoco Collieries, Inc., succeeds Mr. Whitman as ICMI president.



IMPROVING SAFETY—E. W. Murphy demonstrates large-scale production of high-expansion foam for fighting mine fires with desk-top model.

Indiana Coal Mining Institute Themes:

Improving Safety, Increasing Production

Fire prevention and firefighting, continuous mining and open-pit mining with bucket-wheel excavators are subjects of papers at Terre Haute, Ind., April 8.

FACTORS affecting the design of successful fire-resistant hydraulic fluids, a report on the March, 1960, fire at Mine No. 22, Island Creek Coal Co., and an evaluation of continuous-mining machines highlighted the morning session of ICMI at Hotel Deming, Terre Haute, Apr. 8. The afternoon session was devoted to a description of mechanical features and applications of bucket-wheel excavators manufactured in West Germany and the uses of high-expansion foam in fighting mine fires. Presiding at both sessions and at an informal dinner in the evening was Ralph Whitman, superintendent, Ditney Hill mine, Ingle Coal Corp., Elberfeld, Ind.

Mr. Whitman was succeeded in the presidency of the institute by Michael Kensek, safety director, Enoco Collieries, Inc., Bruceville, Ind. Also introduced at the meeting was Ralph C. Newman, recently appointed director of the Indiana Bureau of Mines, succeeding C. A. Purcell, who has served in the post for the last 8 yr.

Other officers of the institute are as follows:

Vice Presidents—W. A. Endicott, general superintendent, Ayrshire Collieries Corp.; Ray Biggs, chief electrician, Viking Coal Corp., and Alfred Lawson, superintendent, Princeton Mining Co.

Secretary-Treasurer—Miss Ethel Morgan.

Executive Board—Reuben Tucker, Thunderbird Collieries Corp.; C. A. Hodgson, Mine Safety Appliances Co.; H. P. Roberts, C. F. Gharst Supply Co.; Nathaniel Kirk, Snow Hill Coal Corp.; Cletus Broecker, Ayrshire Collieries Corp.; Richard Williamson, Snow Hill Coal Corp.; and Ralph Whitman, Ingle Coal Corp.

Abstracts of the technical papers are as follows:

Fire-Resistant Hydraulic Fluids for Mine Equipment, G. R. Jordan, lubrication engineer, Socony Mobil Oil Co., Inc., Danville, Ind.

Fire-resistant hydraulic fluids must be

"built" from available materials and they must, above all, be competitive in price with other materials that will suit the purpose. Such fluids have been available for a long time, particularly for use in aircraft, but the price was prohibitive for mining applications. Thus parallel considerations are fire-resistance and cost.

Other factors which must be designed into the fluid are wear resistance, proper viscosity and viscosity index and stability. Plain water will provide fire-resistance, but other elements are needed to provide the lubricity required by hydraulic fluids.

A proper viscosity index is important since this value represents the change in viscosity that will occur with changes in temperature, a quality that must be controlled. Stability of the mixture of agent and water is important since the material may not be installed immediately upon mixing. Furthermore it was necessary to furnish the material in the form of an inverted emulsion, one in which water droplets are contained inside oil films—not oil in water.

One of the more vital factors to consider in making a change from petroleum-based fluids to fire-resistant types is complete flushing of the old fluid from the system before installing the new. If this is not done, the operator has no idea of the actual fluid in the machine, hence no basis for evaluating its performance. A fair trial of the new fluids is urged, especially since it has been found that mechanical problems may be causing trouble, independent of the fluid used.

In discussion, James Westfield, assistant director, U. S. Bureau of Mines, pointed out that federal coal-mine inspectors will urge fair trials of the new

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NO STOP

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The cables on your shuttle cars and other equipment go through more contortions in one working shift than a tag-team wrestling match.

They flip. They flop. They twist. They flex. No holds barred.

This can mean breakdowns—*more than you can afford*. With ordinary shuttle car cables, "wrong-way" bends often cause the conductors to slip. This distorts the cable; one side may stretch, the other crimp. Perfect invitation to breakdown.

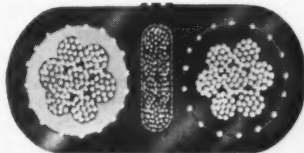
This can't happen when you use Rome 60 Parallel Duplex mining machine cable.

Try to bend Rome shuttle car cable the wrong way.

You can't. It just flips over and bends on its minor axis. That's because conductors and jacket are locked together to prevent damaging "wrong-way" bends.

That's just *one* way you'll move more coal at less cost with this cable. You'll also benefit from the relatively small diameter, easy-handling flexibility, and high resistance to impact, rotting, deterioration, moisture and physical abuse.

Rome Cable Division of Alcoa, Dept. 15-51, Rome, New York.



Neoprene jacket forms resilient web between power conductors and ground. Result: web and jacket are an integrated unit which binds entire cable securely together providing high impact resistance and protection against shorts while maintaining maximum flexibility.



fluids, and must look with disfavor where no attempt is made to work with the new fluids.

Mine No. 22 Fire, W. R. Park, district supervisor, District C, USBM, Mt. Hope, W. Va.

Investigators of the fire, in which 18 men lost their lives, are of the opinion that the combustion may have started when arcing from a trolley locomotive ignited dry timbers. In a relatively short time the fire made such headway that it outpaced attempts to load it out.

Originally 20 men were trapped but two escaped by way of a hazardous route through old workings. Investigators believe the other 18 men may have attempted to retreat to a position for barricading. Unfortunately, some of the entries they used were closed by heaving, and they were overcome.

Recommendations by the investigators include the following:

When portals are abandoned or changed everyone should be informed.

There should be two escapeways from every section.

When multiple intakes are employed, one should be separated from all others by substantial stoppings.

All men should be instructed in emergency action.

Barricading should be taught.

Each underground official should have emergency training.

In reply to a question from the floor on the possibility of reversing the fan in this instance, Mr. Park cautioned that deep thought must be given to this step before it is attempted. He pointed out that the location and movement of each man underground must be definitely known before reversal is even considered.

General Evaluation of Continuous Miners, J. F. Core, vice president—operations—coal, United States Steel Corp., Pittsburgh, Pa.

The recession of 1958, the long steel strike and a slow year in 1960 no doubt slowed the rate of growth of continuous mining. Nevertheless, a review of the record since 1952, when records on continuous mining were first compiled, shows a growth in production from 8.2 million tons in 1952 to 66 million tons when the slowdown had its effect.

Planning for the replacement of conventional systems with continuous systems requires great thought to achieve the desired results. First and foremost, safety must be served in making the change.

U. S. Steel experience indicates that safety has been improved since ribs are more stable in that all ribs have been sheared in continuous mining. Also it is necessary to leave 12 in of head coal in the Pittsburgh seam to gain any semblance of good roof control. Leaving

INDUSTRY MEETING— A Special COAL AGE Staff-Written Report

this head coal is easier with continuous miners.

Rapid advances also are an advantage. Coal that can now be mined in shifts formerly required days, thus permitting shifts of overburden weight to complicate the recovery. In pocket-and-wing methods it is now possible at times to drive a pocket, recover the wing and start another pocket in a single shift. Safety is further enhanced since fewer places are better ventilated and machine controls are farther from the face.

Quality is improved because of the improved roof control, and recovery is increased with continuous mining. However, more fine coal results, which may be a problem where the preparation plant was built prior to the change to continuous methods. Productivity is increased, roof control costs less and dislodgment costs are lower (cost of CM bits against cutting and drill bits and explosives).

Maintenance costs vary with the type of mining machine selected, the natural conditions and the competence of the maintenance staff. It is noted, however, that attention to preventive maintenance is much sharper on continuous-mining machines.

German Brown-Coal Mining With Bucket-Wheel Excavators, Warren L. Gerler, engineer, Mining Div., Link-Belt Co., Chicago, Ill.

The Germans have some bituminous coal which is used largely for by-product coke. Reserves are rather limited and mining costs are high. On the other hand, they have huge reserves of brown coal which is used directly as fuel for their power stations, briquetted for domestic use and used as a base for chemical production. It is similar to lignite—up to 55% moisture—so it cannot be readily stored.

Major problems in mining are deep overburden, handling water (up to 2,650 gal per ton) and backfilling deep pits. Despite these problems costs of mining are less than underground mining, based upon thermal equivalents produced. These costs are a result of the application of the giant wheels and associated belt and rail haulage system. Modern machines range in capacity from 300 to 13,000 cu yd per hr, and can dig 160 ft above and 66 ft below bench level. Output is continuous, and power consumption is low with no peak load requirements.

A soundfilm on applications of the machines concluded this presentation on wheel excavators.

Evaluation of New Fire Fighting Techniques, E. W. Murphy, chemical

engineer, U. S. Bureau of Mines, Pittsburgh, Pa.

Experiments by Bureau of Mines scientists at Bruceton, Pa., the site of the Bureau's experimental mine, show that fire-zone temperatures are greatly reduced within a short period of time after the foam plug reaches the fire. In some instances it was noted that removal of the foam and restoration of the ventilating current resulted in rekindling of the flame. However, at this time it was possible to employ direct methods to extinguish the flames.

It was also determined that foam plugs can be generated equally well with exhaust or forced ventilation, or in atmosphere of reduced oxygen (black damp). The foam will pass an obstruction restricting as much as 90% of the entry area, and in tests it has expanded from a 7-ft-high entry to fill a 17-ft-high cavity. In one test the foam filled 130,000 cu ft of passageway in six parallel intake entries. This test used 2,000 gal of water in 35 min.

Recent studies have been devoted to directing foam toward a fire through a polyethylene sleeve. The plastic tubing may be rolled; it will be unrolled by the advancing foam. If the tubing is too long the fire will burn it off at the point of need. This method has the advantages of quick set-up and generation, without a need for construction of a number of foam-guiding stoppings.

A number of detergents may be used to prepare the foam. The most satisfactory results in the Bruceton experiments were obtained with a commercial ammonium lauryl sulfate. Besides being a reliable foaming agent, the detergent should be relatively soluble in water, non-freezing, nontoxic, nonflammable and economical. It is also desirable that the detergent be non-corrosive.

Bituminous Output

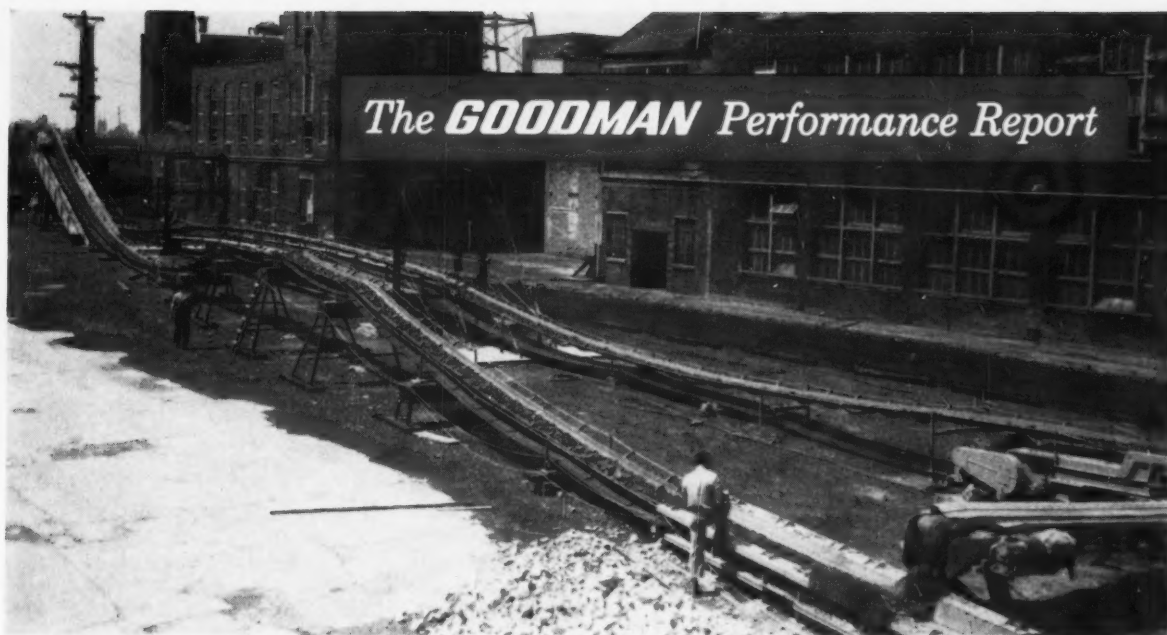
YEAR TO DATE	PRODUCTION
April 8, 1961	97,107,000
April 9, 1960	119,591,000
1961 output 18.8% behind 1960.	

WEEK ENDING	PRODUCTION
April 8, 1961	6,565,000
April 9, 1960	8,382,000

Anthracite Output

YEAR TO DATE	PRODUCTION
April 8, 1961	5,298,000
April 9, 1960	5,189,000
1961 output 2.1% ahead of 1960.	

WEEK ENDING	PRODUCTION
April 8, 1961	265,000
April 9, 1960	260,000

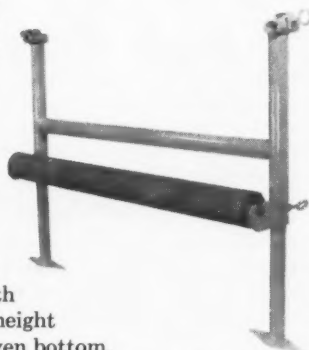


What's new in ROPEBELT® conveyor design?

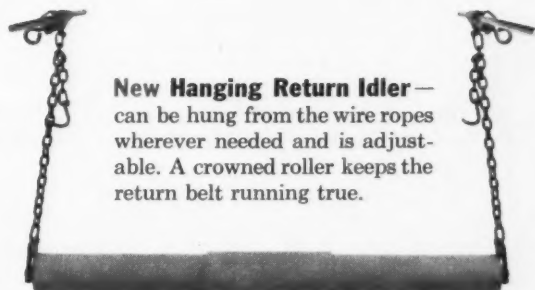
Here, for example, are some of the latest improvements in component units now available—but only after severe use underground and at the 800' test-loop installed at the Goodman main plant many months ago.



New Carrying Idler—a full-flex low rope idler that raises the ends of the wing rolls above the wire ropes without any sacrifice of the flexibility that means big payloads with no spillage. The outer ends of the wing rolls also have a two-way lateral movement that trains the belt when moving outby or inby.



New Rope Supporting Stand—this is a simple, easily handled, non-walking goal post type stand with each side adjustable in height to compensate for uneven bottom. It can be used with or without a return roller.



New Hanging Return Idler—can be hung from the wire ropes wherever needed and is adjustable. A crowned roller keeps the return belt running true.

These are representative of the many improvements that have been made by Goodman since originating and introducing the ROPEBELT conveyor to the mining industry in 1955. More will come. All are for the operator who is looking for the best way to move more material quickly and economically so as to get a greater return on his investment in high capacity production equipment.

Call in Your Goodman Sales Engineer Now!

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CUTTING MACHINES • CONVEYORS • LOADERS
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Use Genuine Goodman Replacement Parts

News Roundup (Continued)

NEW DIRECTOR OF THE OFFICE OF COAL RESEARCH, GEORGE A. LAMB (right), is sworn in at a special ceremony April 11 in the office of Interior Secretary Stewart L. Udall (center). Oath was administered by Floyd Dotson chief clerk of the Department. The Secretary praised Mr. Lamb as "a first-rate man" and promised vigorous efforts in coal research. President Kennedy appointed Mr. Lamb as the first permanent director of the new agency. Mr. Lamb had been manager of business surveys for Consolidation Coal Co. since 1946. He was chief economist for the Solid Fuels Administration during World War II and assistant director of the Bureau of Mines from 1944-46.



American Coal Shipping to Sell

American Coal Shipping, Inc. expects to obtain an agreement to sell Bull Steamship Lines, a wholly-owned subsidiary, in the near future.

Organized in 1956 when freighter tonnage was in great demand due to the Suez Canal crisis, American Coal Shipping was to provide transportation for coal exported to Europe, but it never began "extensive" operation of freighters. Since Bull Steamship, acquired in 1957, is the company's only operating

subsidiary, it is possible that American Coal Shipping will be liquidated though no decision has yet been made.

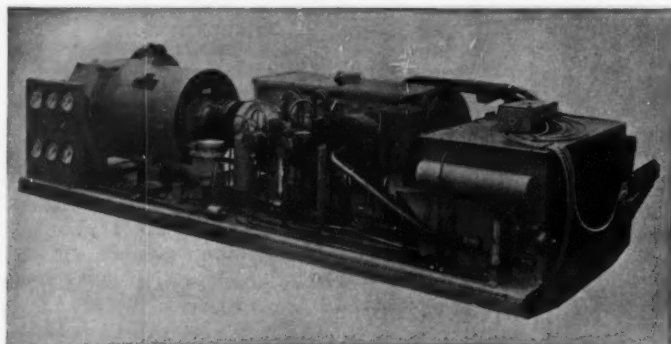
Galvanizers' Awards

Ten awards of \$1,000 each have been announced for ideas developing new applications and markets for hot-dip galvanizing. They are not competitive, and are offered by the American Hot Dip Galvanizers Association, with the cooperation of the American Zinc Institute. It is emphasized that the program

is not a "contest" but rather a search for ideas. When an entry is judged as meriting an award, it will be granted immediately.

Inquiries and entries should be addressed to American Hot Dip Galvanizers Association, 5225 Manning Place, N. W., Washington 16, D. C. New ideas on improvements will be considered, as well as ideas for new methods of after treatment. Each entry must embody all the data needed for utilization of the idea, and must be accompanied by a release of the application or idea for general use without payment or royalty other than the award. Entries must be submitted before May 1, 1962.

THE ARMSTRONG AIRBREAKER* SYSTEM . . .



- More Large Coal—Less Fines
- Greater Safety
- Operational Simplicity
- No Fumes or Smell
- Lower Cost

... For Blasting Coal with High Pressure Air

The Armstrong *AIRBREAKER* System represents a modern and versatile method with which coal (or other minerals) can be prepared for loading operations. It can be applied to Longwall, Room and Pillar and Steep Seam methods of working, and is equally effective in cut or uncut coal. The System comprises a compressor, pipeline and Armstrong blasting shells, through which the high pressure air is discharged to break out the coal.

See our Exhibits on Stand 112 at the Cleveland Coal Show

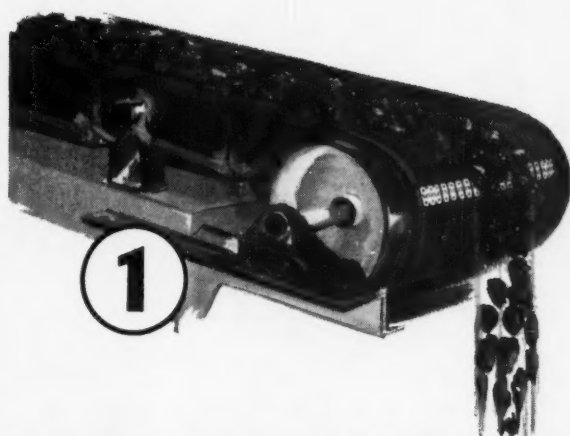
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1 FLEXCO HINGED FASTENERS (No's. 500X & 250X)
FOR GATHERING AND PANEL BELTS

- One type fastener to join belts of different thicknesses — 500X, for thick belts, will mesh with 250X, for thin belts.
- Tremendous holding power on worn or new belts. Require fewer holes (unlike perforating type fasteners which weaken belt with many damaging holes).
- Steel tipped nylon covered hinge pin, pioneered by Flexible — will not work out of splice!

2 FLEXCO FASTENERS FOR MOTHER BELTS

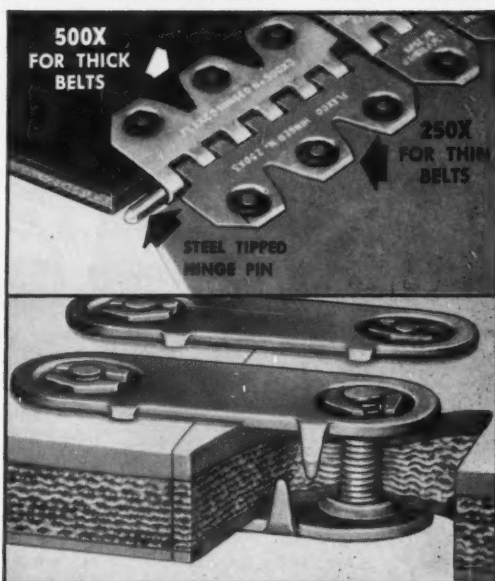
- Same excellent holding power as Flexco Hinged plates.
- Make a tight-butt joint . . . trough naturally.
- Teeth are spaced for best gripping action on both sides of belt.
- Easy application . . . damaged plates quickly replaced . . . ideal for new or worn belts!

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"MAINTENANCE TIP"**

"Before applying new splice, be sure to cut belts back to sound material wherever ends have deteriorated or been damaged."



News Roundup (Continued)

Coal Cos.' Net Incomes Drop

Net income of 22 leading coal corporations declined 8% in 1960, First National City Bank of N. Y. reported. Compiled from published annual reports, the figures show net income after taxes (but in some cases, before depletion allowances), for the 22 firms was \$69,361,000 in 1960 compared with \$75,538,000 in 1959. However, the book assets of the companies increased from \$995,919,000 to \$1,062,980,000. Their return on net assets fell from 7.6% to 6.5% but their margin on sales rose from 5.1% in 1959 to 5.6% in 1960.

EG&FA Undertakes Record Expansion

A \$9,400,000 capital improvement program for 1961, a record for a 1-yr period, is under way in the Coal Div. of Eastern Gas & Fuel Associates.

Expansion expenditures for this year include completion of a major new coal cleaning and preparation plant at East-

ern's Federal No. 1 mine near Fairmont, W. Va.; addition to cleaning facilities at the company's Keystone mine at Keystone, W. Va.; and normal replacements and extensions, including mine cars and other equipment. Eastern's coal research facilities and activities also are being expanded.

Announcement of the program was made by W. B. Ross, Eastern vice president and general manager of the Coal Div. He said the program reflects his company's confidence in the future of the coal business despite the fact that "this month (April) may be one of the poorest months in the industry's history."

P&M Offices Centralize

Spencer Chemical Co.'s plans for diversification and expansion include full use of the mining skills of its subsidiary, Pittsburg & Midway Coal Mining Co. All corporate staff functions of P&M located in Pittsburg, Kan., will be integrated into Spencer's general offices at Kansas City, Mo., as space becomes available. This move is the first step in

consolidating the executive, operating and sales departments of the mining company in one central location. Spencer acquired P&M in June, 1960.

TVA Lets Contracts to Coal Areas

The Tennessee Valley Authority recently awarded \$9,304,998 in long-term contracts for 3,240,880 tons of coal for its steam-electric generating plants.

Nearly three-fourths of the total will be produced in Western Kentucky and the largest single contract—\$3,305,888 for 1,215,400 tons—went to Kirkpatrick Coal Co., Memphis.

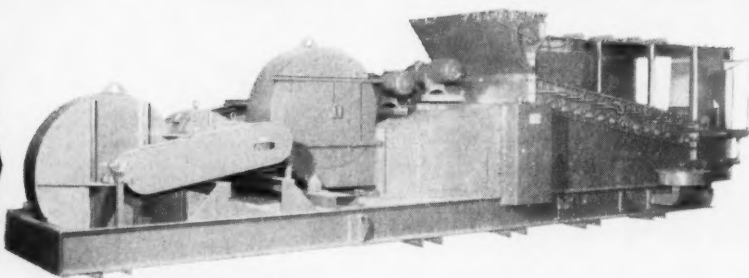
More awards will be made to bring total purchases from a bid opening Feb. 14 to 70,000 tons per week.

Mines, Companies

Maust Coal & Coke Corp., New York, N. Y., recently took over operation of Bird Coal Co. Officials explained that a sale has not been consummated but the Maust interests will run the Bird No. 2 mine at Tire Hill, Pa. and Bird No. 3 mine at Riverside, Pa. Roy Simmons will succeed Marlin J. Weber, long-time operational vice president of the Bird firm.

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- ALL PARTS ON ONE BASE
- READY TO OPERATE
- 3 MODELS FROM 35 TO 75 T.P.H.

RIDGE AIRJIG Cuts Preparation Costs

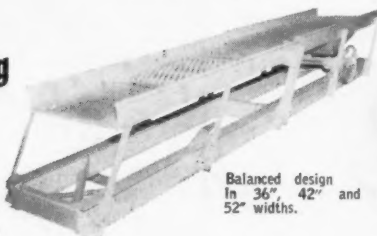


The Ridge Airjig combines efficiency with economy to give you the most practical, dry preparation of clean, marketable coal available. Separator, motors, blowers and controls are all mounted on one base . . . make the Ridge Airjig a complete, compact

unit ready for immediate operation when placed under surge bin. Perfectly balanced rotating parts eliminate need for expensive, permanent foundation structures. Operates with top efficiency even on feeds with up to 8% moisture.

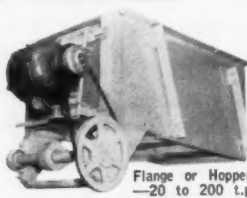
Other
Ridge Equipment
For Low Cost Handling
Of Coal . . .

RIDGE TANDEM
VIBRATOR SCREENS

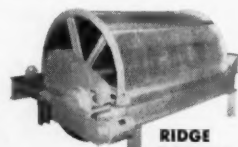


Balanced design
in 36", 42" and
52" widths.

RIDGE
VIBRATOR FEEDERS



Flange or Hopper Types
—20 to 200 t.p.h. capacities.



RIDGE
ROTARY
BREAKERS

6' to 9' diameters. 10' to 18' lengths. Center shaft or trunion design—50 to 500 t.p.h. feeds.

RIDGE EQUIPMENT COMPANY

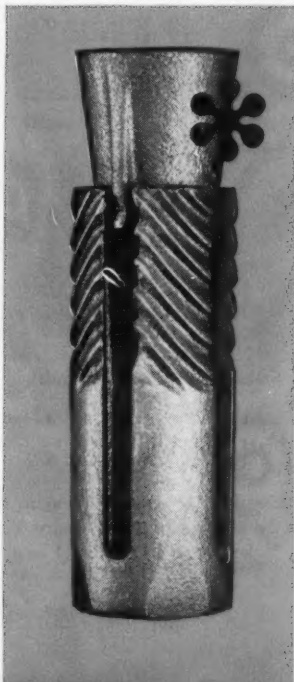
Manufacturers of Heavy Media Plants • Screens • Feeders • Crushers • Conveyors
FRUGALITY, Pa. P.O. FALLENTIMBER, Pa. Phone: Altoona, Windsor 2-6435

O-B Designs For Mining Men



RESULT:

A 4-way expansion unit that holds in soft shale or hard rock



4-WAY EXPANSION UNIT BUILDS HOLDING POWER FAST . . . because the flexible fingers of the shell are slightly pre-expanded to grip the wall even before wrenching begins.

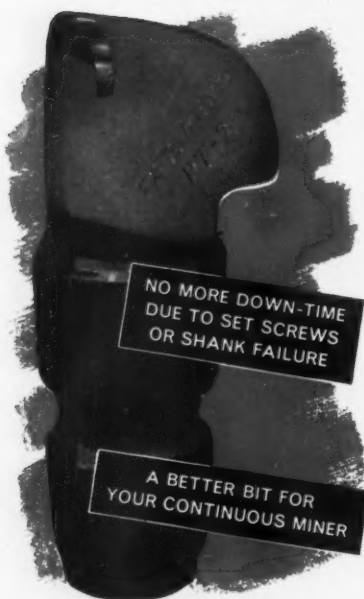
GOES UP FAST AND STAYS PUT. When the bolt is shoved up the hole, the expansion unit holds the bolt in place until it's tightened . . . no need to have hands exposed to injury during wrenching.

GREATER STRENGTH IN HARD TOP . . . BETTER "PURCHASE" IN YIELDING TOP . . . because the expansion pressures are spread evenly over the four shell fingers to make the best use of the entire unit's strength. These are the reasons for the O-B Expansion Unit's popularity with mining men. It is easy to understand why more mine roof is supported with O-B Shells and Plugs than with any other kind.

For further information and prices, see your local O-B sales-engineer or write us now. OHIO BRASS COMPANY, MANSFIELD, OHIO, Canadian Ohio Brass Company, Ltd., Niagara Falls, Ontario.

Ohio Brass 
HOLAN

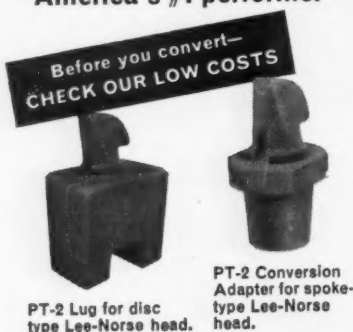
EXPANSION SHELLS AND PLUGS • LINE MATERIALS • SAFETY
AND CONTROL EQUIPMENT • ELECTRIC HAULAGE MATERIALS



Successful field use proves

PROX PT-2 TAPERED SHANK BIT

America's #1 performer



**CROSS SECTIONAL AREA OVER
TWICE AS GREAT AS 1/2 X 1!**

Less inventory, less maintenance—no set screws, roll pins, or rubber retainers.

Round shank exceeds 3 times the back-up area of conventional bits. Incorporates improved aligning—assures perfect match between holder and bit—is easily removed from top or bottom. You get less distortion; positive bit-angle maintained; quicker, more accurate setting; no bit-vibration; longer life for carbide.

PROX

**FRANK PROX COMPANY, INC.
TERRE HAUTE, INDIANA**

Write for the name of your nearest Prox Sales Representative for complete information.

News Roundup (Continued)

Utilization

A contract for two giant boilers—the largest ever ordered—was awarded to Combustion Engineering, Inc. by the Tennessee Valley Authority. They will serve two 900,000-kw General Electric turbine generators.

Each boiler will consume 315 tons of coal per hr and produce more than six million pounds of steam per hr at 2,400 lb per sq in and a temperature of 1,050 F. One-third larger than any other boiler ordered to date, each unit towers 18 stories high and has twin furnaces totaling 114 ft in width.

Contract price is \$34,660,000 for the two, the second being covered by an option which may be exercised on or before July 1, 1962. First unit is scheduled for operation by September, 1964 and the second a year later.

Kentucky Utilities Co. plans a new \$17.5 million electric generating unit for the Dix Dam Station which provides power for 78 towns.

The unit will use 400,000 tons of coal annually and will require a work force of nearly 300 men during the peak construction period. Indirect employment would be provided for about 200 miners needed to supply the additional coal.

Scheduled for operation in June, 1963, the unit will have a 156,250-kw capacity.

Another battery of by-product coke ovens was placed in operation by the Pittsburgh Works of Jones & Laughlin Steel Corp. Representing another phase in J&L's cost reduction program, the new battery will consist of 59 smokeless ovens. Coal for the ovens will be charged mechanically rather than by gravity for a more uniform distribution.

J&L also has under construction another battery of 118 smokeless coke ovens scheduled for completion later this year. The expanded by-product coke facilities will provide ample coke for the Works' six blast furnaces.

Commercial exploitation of a new process to convert bituminous coals to coke pellets is being undertaken by the U. S. Smelting Refining & Mining Co. and Victor Chemical Div., Stauffer Chemical Co.

The process, which originated and was successfully tested in research labs of U. S. Smelting, is said to be unique in many of its features, particularly in its ability to produce coke from western coals which are not amenable to coking by existing processes.

Completion of the new plant to be

located at Midvale, near Salt Lake City, Utah, is expected near the end of this year.

Stauffer's Victor Div., operating electric furnaces for phosphorus production, will be a substantial consumer of coke from the new plant. The pelletized coke will be available to electrometallurgical, electrochemical and other consumers of coke for production of calcium carbide, elemental phosphorus and other purposes.

Safety

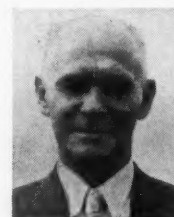
Coal Age was granted the National Safety Council's Public Interest Award for 1960, an honor first won by Coal Age in 1953.

This annual noncompetitive award honors organizations in the mass communications field for exceptional service to safety.

Awards went to 53 daily and 25 weekly newspapers, two television and five radio networks, 67 television and 180 radio stations, 19 general and 57 specialized magazines, 16 labor publications, 78 outdoor advertising companies and 45 advertisers.

Established in 1948, the Public Interest Awards are presented in recognition of leadership, initiative and originality by the mass media in the promotion of accident prevention.

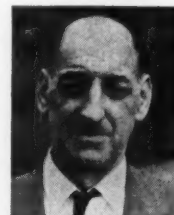
Four employees of southern West Virginia mines of Eastern Gas & Fuel Associates have been recommended to receive Joseph A. Holmes' Safety Awards.



Stevenson



Spangler



Meade



Rash

Each man achieved a record of more than 40 yr mine employment without a lost-time accident.

Arthur P. Stevenson, foreman and presently watchman at Stotesbury No. 9 mine, Helen, W. Va., can boast to a 45-
(Continued on p 58)

ALLISON

eases driver training

TORQMATICALLY



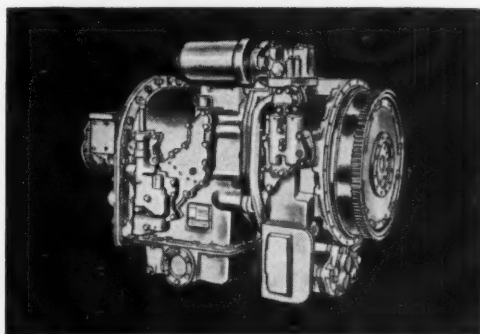
IN 80-TON COAL HAULERS—

Two of these LeTourneau-Westinghouse TORQMATIC-equipped LW-80 coal haulers replaced five 26-ton trucks at a Kentucky coal mine. "Even in wet weather and with 90-ton loads," the company reports, "the TORQMATIC units get underway slow and easy. A transmission like this that can take up the shock and, at the same time, give us the full benefit of 525 horsepower is bound to cut our maintenance costs to a minimum."



IN BIG LOGGING TRUCKS—

This Kenworth Model 849 logging truck is big as all outdoors, yet drives about as easy as a small pickup. Reason? Its Series 5000 TORQMATIC Converter-Transmission team takes the guesswork out of shift-work, eliminates the clutch pedal, is so simple to operate that the newest drivers look like "pros" after a day at the wheel.



IN ANY 450-525 H.P. UNIT—

Newest 5000 Series TORQMATIC DRIVE is the CLBT 5940 designed for Diesels delivering 1,200 ft.-lbs. of torque. It fits large off-highway trucks, scrapers and other high-horsepower, heavy-duty applications, includes a torque converter, hydraulic transmission, lock-up clutch and optional integral TORQMATIC retarder. With 4 forward ranges and 1 reverse, giving 12-phase TORQMATIC operation, it can be direct-engine or remote-mounted with straight-through or transfer case output. Top- or side-mounted power take-offs are also included.—Mail the coupon today for full details.

Allison TORQMATIC
TORQMATIC® DRIVES

The world's most complete line of hydraulic drives

Over 980 models used by 108 manufacturers in
100 to 525 H.P. equipment

Allison Division of General Motors
Dept. CA-4 Indianapolis, Indiana

Please send me application data on your
5000 Series TORQMATIC DRIVES

Name

Title

Company

Address

City State



...the personal property and interests of the individual... the payment of interest on the...



man for the Vice President, and
man selected Charles Clifford for the
diff. regions both a non-partisan
immediate priorities for the Pr
The study is being conducted by

How Aeroquip Hose and Reusable Fittings cut downtime

For Penn Coal & Coke Co., Ehrenfield, Pa.



Aeroquip Flexible Hose Lines are easily installed in tight places



Penn finds stock of Aeroquip Bulk Hose prevents downtime



A small stock of fittings serves all requirements

Miles Davis, Superintendent of Maintenance for Penn Coal & Coke Co., says, "We have tried other brands of hose and fittings and have always gone back to Aeroquip because of better results."

Like other coal field users, Mr. Davis finds that a small stock of Reusable Aeroquip Fittings and Bulk Hose economically supplies any replacement hydraulic, fuel and oil line needed for continuous miners, loaders and other equipment.

Dependable and rugged Aeroquip Hose Lines are easily assembled where and when needed.

Call your local Aeroquip Distributor today. He is listed in the Yellow Pages.



Bulk Aeroquip Hose can be cut to length and installed on the job without special tools. Fittings can be used again and again.

Aeroquip

AEROQUIP CORPORATION, JACKSON, MICHIGAN
INDUSTRIAL DIVISION, VAN WERT, OHIO
WESTERN DIVISION, BURBANK, CALIFORNIA
AEROQUIP (CANADA) LTD., TORONTO 19, ONT.

AEROQUIP PRODUCTS ARE PROTECTED BY PATENTS IN U.S.A. AND ABROAD

News Roundup (Continued)

yr record. He started as a miner in 1916 with U. S. Steel Co. and joined Eastern in 1943.

James Spangler, also a 45-yr man, has worked as a conveyor boomman and hand loader. An Eastern employee since 1929, his career started in 1916 and he has worked at Crab Orchard, Rock Springs and New River Co.

Leonard Meade, a wireman at Wharton No. 2 mine, Barrett, W. Va., has been mining coal for 44 yr. Mr. Meade joined the company in 1956 and has worked at a number of Eastern's mines.

Stratt Rash has been a coal loader, driller, machine operator and belt operator during his 43 yr in coal. Presently employed at Wharton No. 2 mine Barrett, W. Va., he joined Eastern in 1949. He started in 1918 with the West Virginia Coal & Coke Co. in Omar.

The Holmes safety program is sponsored by the U. S. Bureau of Mines, National Coal Association, United Mine Workers of America, Southern Coal Producers Association and Bituminous Coal Operators Association. Award winners each receive a certificate and a reflective decal for their safety hats.

Preparation Facilities

Anthracite By-Products Co., Wilkes-Barre, Pa.—Contract closed with Wilmot Engineering Co. for 250-tph complete Wilmot heavy-media and hydrotator preparation plant; preparing coal and controlled-ash feed to lightweight aggregate plant; 200 tph $\frac{3}{4} \times \frac{1}{2}$ feed to Wilmot-OCC No. 688 heavy-media vessel and 50 tph of $\frac{3}{32} \times 60M$ feed to completely automated Wilmot 6-ft hydrotator. Plant features Wilmot heavy-media Specific Gravity Control System holding variation in specific gravity of media to ± 0.003 .

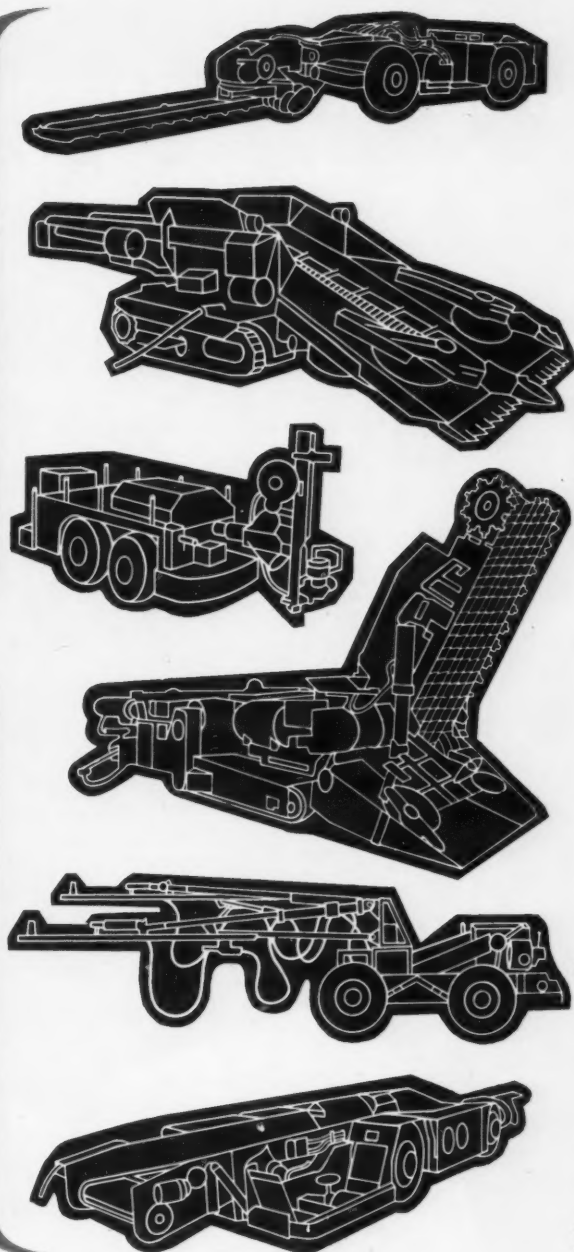
Royalty Smokeless Coal Co., Cliff top, W. Va.—Contract closed with Deister Concentrator Co., Inc., for one Concenco "77" twin-deck, Diagonal Deck coal washing table and one Concenco Splitter for feed distribution for handling $\frac{1}{4} \times 28$ mesh jig refuse.

Maple Springs Coal Corp., Branchdale, Pa.—Contract closed with Deister Concentrator Co., Inc. for three Super-Duty Diagonal Deck No. 7 coal washing tables to handle barley size and No. 4 buck size anthracite.

Candleton Coal Co., Gilberton, Pa.



WHY BUY MORE WHEN TWO WILL DO?



Two versatile Esso products are all you need to do nearly every underground lubricating job...

NEBULA® EP 5F, a semi-fluid grease, lubricates gears, bearings, clutches and linkages. It combines extreme-pressure and anti-wear protection with effective oxidation inhibition. Heat and churning do not change it. Its semi-fluid consistency helps reduce leakage. (For equipment on which wear or leakage is especially severe, heavier-body Nebula EP 6F is recommended.)

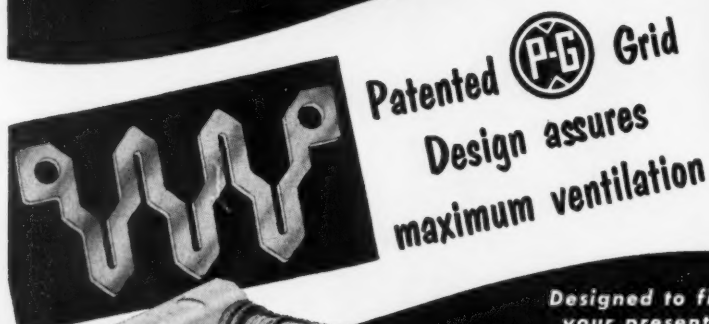
NUTO® hydraulic oil gives long-lasting protection against rust in damp mine conditions. Both rust and oxidation inhibited, it stays fluid for fast start-ups at low temperatures; holds a good body in high heat to minimize leakage and pump wear.

Your Esso Representative, backed by our Sales Service Laboratories, will work closely with you to help solve your lubrication problems. Contact him, or write to us at 15 West 51st Street, New York 19, New York.

ESSO STANDARD, DIVISION OF
HUMBLE OIL & REFINING COMPANY

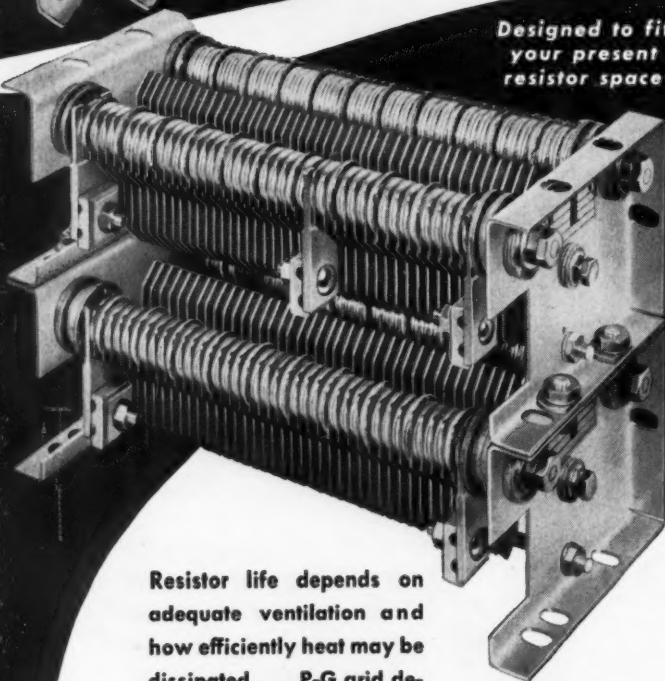


Resistor life depends on adequate ventilation...



Patented **P-G** Grid
Design assures
maximum ventilation

Designed to fit
your present
resistor space



Resistor life depends on adequate ventilation and how efficiently heat may be dissipated . . . P-G grid design equalizes the amount of air space surrounding each leg or loop to obtain even heat throughout the grid area. (Note illustration.) . . . Since heat is rapidly and evenly dissipated, hot spots fail to develop and longer resistor life is assured . . . For a nonbreakable resistor (only steel and mica used) specify P-G on your next application.



The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

OFFICE and FACTORY—Kenton Lands Road, Erlanger, Kentucky

MAILING ADDRESS—Box 709, Covington, Kentucky

News Roundup (Continued)

—Contract closed with Deister Concentrator Co., Inc. for three Model 109 Concenco revolving feed distributors for anthracite.

Food Machinery & Chemical Corp., Kemmerer, Wyo.—Contract closed with Deister Concentrator Co., Inc. for two Model E 5x8-ft Leahy vibrating screens with FlexElex heating arrangement and Concenco Dual Screw Feeder for screening bituminous coal at 1/8-in separation.

Armco Steel Corp., Robin Hood Mine, Twilight, W. Va.—Contract closed with Jeffrey Mfg. Co. for two-cell addition to existing Jeffrey Baum jig. Also contract closed with Kanawha Mfg. Co. for installation of R-O-M crushing, conveying and storage and additional washing facilities to handle 6x0 coal at 500 tph.

Royalty Smokeless Coal Co., Clifftop, W. Va.—Contract closed with Kanawha Mfg. Co. for Deister table installation to treat 1/4x0 coal at 22 tph.

New River Co., Summerlee Mine, Summerlee, W. Va.—Contract closed with J. O. Lively, Inc. and J. O. Lively Mfg. & Equipment Corp. for fine coal cleaning and thermal drying plant to wet wash 160 tph of 1/4x0 coal on twin-deck Deister tables. Thermal drying will be by Heyl & Patterson Fluid Bed Dryer. Water clarification circuit consists of H&P cyclones and Peterson filter.

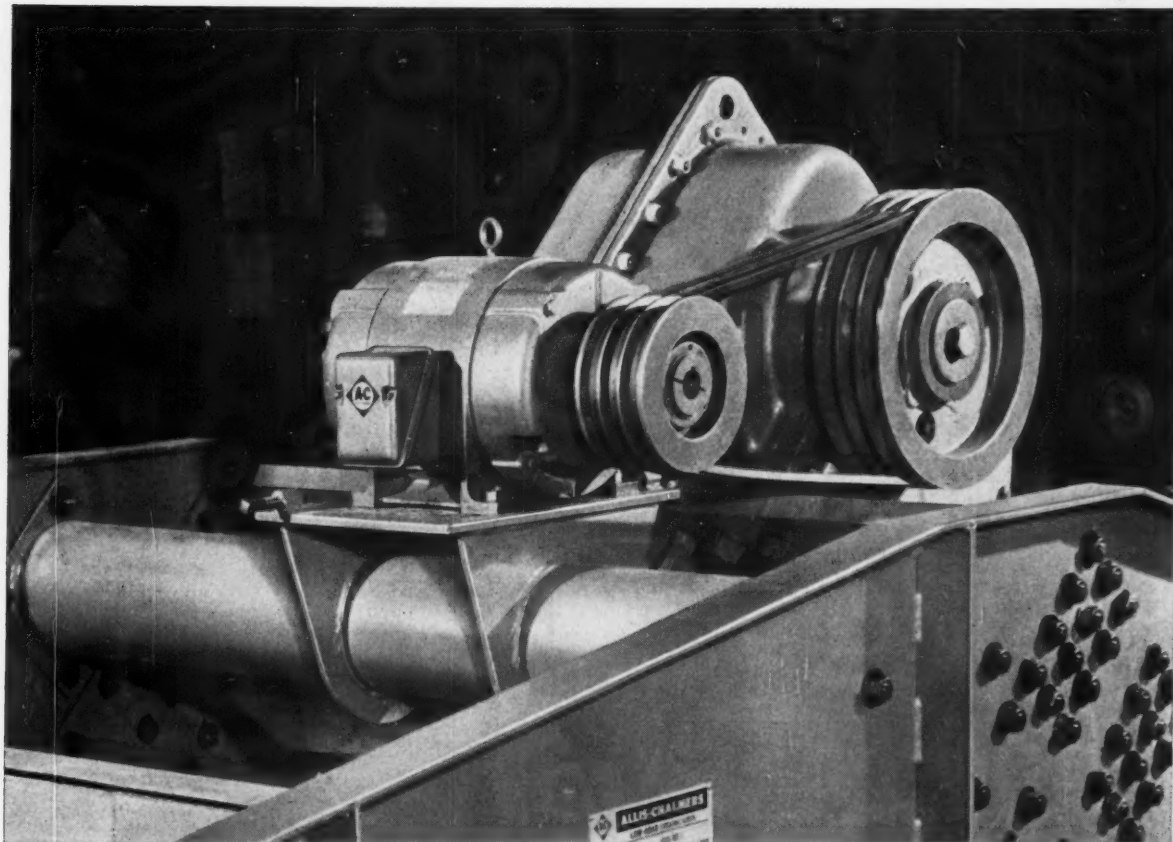
Utility Coal Co., Deer Park Mine, Deer Park, Md.—Contract closed with Ridge Equipment Co. for complete Ridge preparation plant including Ridge Variable Feed feeders, rotary breakers and Ridge Airjig to handle 75 tph of r-o-m coal.

How Did He Know?

(see p138)

The sighted man sees both other hats, the half-blind man sees the blind man's hat. If the sighted man saw two red hats he would know his own hat was white and he would have his freedom. He must have seen two whites or a red and a white. If the half-blind man, using the clue from the sighted man, saw a red hat on the blind man he would be certain his own hat was white. If he saw a white hat on the blind man he could not be certain. Since the half-blind was not certain, the blind man knew his hat must be white.

ALLIS-CHALMERS



Aero-Vibe, Low-Head, Ripl-Flo and Super-Seal are Allis-Chalmers trademarks.

The motor rides piggyback

Another Allis-Chalmers first goes to market...

Low-Head screen with direct-mounted motor for lower costs

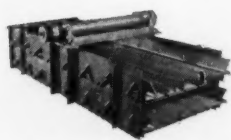
With these advanced screens, you shave *dollars* from installation and operating costs... without sacrificing a penny's worth of performance.

You eliminate motor-supporting structures, belt tensioning and alignment problems. You save space, simplify inspection, cut maintenance time... and *profit* the difference.

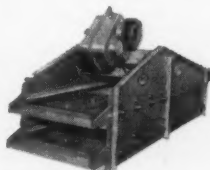
Too, you can count on the efficiency and reliability that is traditional because of Allis-Chalmers long expe-

rience in building vibrating equipment. TEFC or *Super-Seal* motors resist water, dust and abrasives... provide insurance against downtime that pays off in further savings.

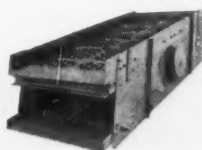
Let A-C engineers tackle your screening problems. Simply send them to us and we will submit an engineered recommendation on the most economical screen for your particular job. **Allis-Chalmers**, Industrial Equipment Division, Milwaukee 1, Wisconsin. A-1464



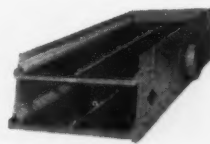
Model AVS AERO-VIBE inclined screen for economical scalping and coarse sizing.



LOW-HEAD horizontal screens for efficient coarse to fine sizing (wet or dry), rinsing, thickening, de-watering, media recovery.



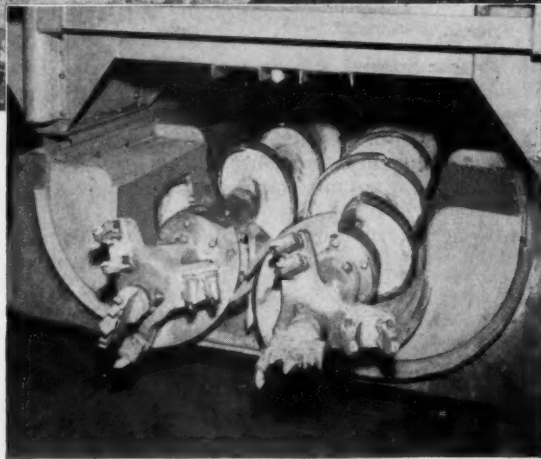
Model XH RIPL-FLO inclined screens for cost-saving scalping and coarse sizing.




Model SH RIPL-FLO inclined screens for light scalping, coarse to fine sizing (wet or dry) and rinsing.



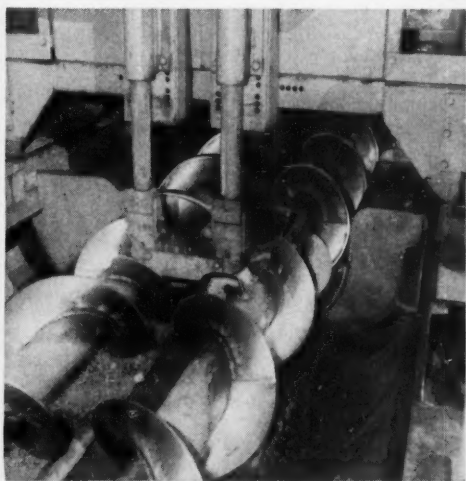
AUGERS ROTATE IN OPPOSITE DIRECTIONS eliminating the problem of one cutting head climbing over the other! Coal feeds back evenly on both augers, which maintains a better size consistency.



COAL PRODUCTION IS INCREASED by new rib breakers and special cutting heads designed specifically for this Dual coal auger. Holes look like this 

DUAL COAL AUGER

AUTOMATIC COUPLING AND UNCOUPLING OF AUGERS take place from operators' positions by means of automatic latches. Machine positions augers for fast coupling.



increases profit...

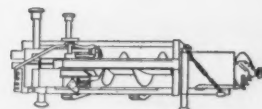
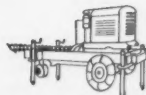
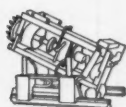
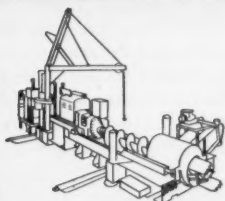
mines low seam coal...

increases recovery...

Salem's powerful, new Dual brings low seam coal into the profit class by increasing practical boring depth to 200 feet (100% increase over previous equipment), handling augers from 18" to 30" diameter with only minor machine adjustments, and cutting straight and true in seams only inches thicker than the augers. Coal feeds back along both augers, maintaining the consistency of the size cut. Coal is cleaner and recovery is 50% higher. Your profit is higher. The Dual, like all Salem coal augers, is self-moving. It stores 300 feet of augers in racks on the machine. The operator's view of the highwall is unobstructed.

The Salem Dual is an entirely new concept in coal recovery drills. Investigate it today. Write for Salem Bulletin CR-D61. It gives complete information.

See Salem's Dual Display at the Coal Show • Booth 1708



THE **SALEM** TOOL COMPANY

763 SOUTH ELLSWORTH AVE. • SALEM, OHIO

DAVEY Rotary Drills

...working partners of the coal industry



Davey Model M-8A Rotary Drill operated by Jim Tyger Drilling Co. of New Bethlehem, Pa., at Asco Mining Co., Knox, Pa.

For more economical, faster drilling and increased coal production, leading strip operators rely on Davey.

Suitable for either truck or tractor mounting, Davey Drills move fast between blast holes. They cut blasting costs, increase effectiveness of blasts and speed overburden removal.


Daveys are available in 8 models. Air blast, mud pump or combination types. Rated capacities to 3,500 ft. A-2090A

Write for Bulletin E-702S




DAVEY COMPRESSOR CO.
Kent, Ohio


pioneers of
"air-cooled air"




Portable Compressors




Auto-Air
Compressors




Tank-Mounted
Compressors



Air Tools



Stationary
Compressors



Rotary Drills

People (Continued)

James W. Haley, vice president, Jewell Ridge Coal Corp., has been appointed a member of the National Coal Association's government relations committee. He succeeds Dr. Huston St. Clair, president of Jewell Ridge.

T. C. Jackson has joined Emerald Coal & Coke Co. as general superintendent. Mr. Jackson was formerly employed by U. S. Fuel Co., serving in several capacities, including general mine foreman and general superintendent.

Obituary

Wilbur A. Marshall, chairman of the board and president, Marshall Coal Corp., died April 9 at the age of 84. Mr. Marshall spent considerable time in the coal regions and also supervised mining operations at his different properties. Some improvements he made included widening the gage of tracks in mines and designing the hinged-top sideboards of coal cars.

Association Activities

The Society of Mining Engineers installed William C. McCulloch as Chairman, Coal Div., other new officers of the Coal Div. are: Secretary-treasurer—George E. Keller, manager, coal evaluation, U. S. Steel Corp.; members of the executive committee—Henry J. Hager, vice president-mining, Alabama By-Product Co.; James D. Reilly, vice president, Hanna Coal Div., Consolidation Coal Co.; Wilbur A. Weiner, chief engineer, Peabody Coal Co.

The Utah-Wyoming Coal Operators Association reelected its present officers and directors April 5 in Salt Lake City. President—Earl J. Evans, vice president, Royal & Spring Canyon Coal Cos.; vice president—H. J. Schultz, manager, Western Coal Mining Co. Directors: W. J. O'Connor, president, Independent Coal & Coke Co.; G. E. Sorensen, president, Kemmerer Coal Co.; W. W. Clyde, president, Knight Ideal Coal Co.; Walker Kennedy, president, Liberty Fuel Co.; Grant A. Foulger, assistant general manager, Lion Coal Corp.; and Oscar A. Glaeser, president, U. S. Fuel Co. T. J. Canavan was reappointed executive secretary and treasurer.

ON DISPLAY AT THE
COAL SHOW
BOOTH 2512

NEW!



Model P-1044

(U. S. Bureau of Mines Approval No. 2F-1587)

KERSEY "BIG WORK-HORSE" Permissible Tractor

Indispensable emergency unit in case of power failure
Safest method for moving power centers in A. C. mines

Features:

Simple, clean, rugged design for easy maintenance.

Positive 4-wheel drive (equipped with limited slip differentials).

All the power you need with 2-10 H. P. continuous duty motors.

Permissible, explosion-proof unit (approved by the Bureau of Mines) assures greater safety.

Wherever heavy duty permissible equipment is required, put the new Kersey "Big Work-Horse" Permissible Tractor on the job. This Model P-1044, 10,000 lb. rubber-tired tractor has all the features you want and need.

COMPLETE YOUR PERMISSIBLE EQUIPMENT LINE with!—

Kersey Model P-744, 4-wheel drive, steer and brakes, weighing 7,000 lbs. for smaller duty jobs in restricted mine travelways . . . and Kersey Model PPC-9 Permissible Personnel Car and Utility Tractor, which can also double as a tractor for towing supply and man-trip cars.



KERSEY MANUFACTURING CO., INC.
BLUEFIELD, VIRGINIA

When you want modern equipment for modern haulage and want the best — check with Kersey first

FOR IMPROVED MINE SAFETY PLUS

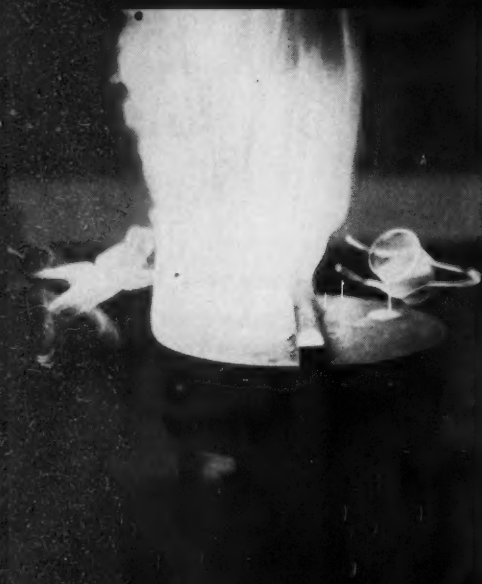
NEW, ECONOMICAL

PYROGARD

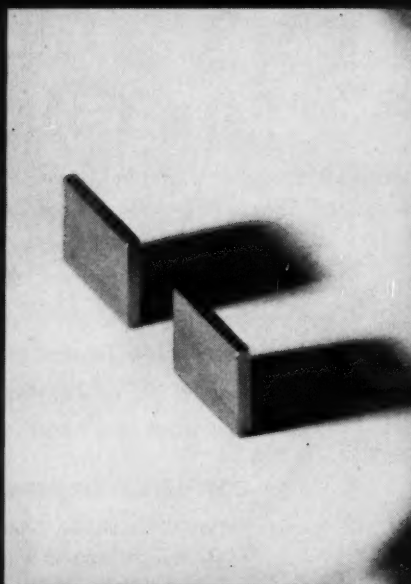
FIRE-RESISTANT FLUIDS



HERE'S HOW PYROGARD CAN HELP YOU!



Ignition resistance approved by USBM—PYROGARD helps you protect your property and personnel against fire. It passes comprehensive fire-resistance standards of US Bureau of Mines (USBM approval No. 30-3). Ignition resistance is demonstrated here. Hydraulic oil (left) bursts into flame immediately and PYROGARD (right) resists combustion when poured onto steel plate heated to 1000°F.



Good anti-wear properties assure long pump life — PYROGARD fire-resistant fluids are designed for pumps and pressures commonly encountered in mining machinery . . . give excellent protection against pump wear for fluids of this type, even at elevated temperatures. Pump vane at left is new. Vane at right has 1000 hours of service with PYROGARD at 160F and 1000 PSI. Wear is almost undetectable.



Compatibility with seals, metals eases fluid installation — PYROGARD fire-resistant fluids are easily installed because they have no adverse effect on most packings, seals, or hoses, and are non-corrosive to metals normally found in mine hydraulic systems. Containing effective rust inhibitors, PYROGARD fire-resistant fluids give excellent protection against rusting wherever they contact metal.

POSITIVE HYDRAULIC RESPONSE...

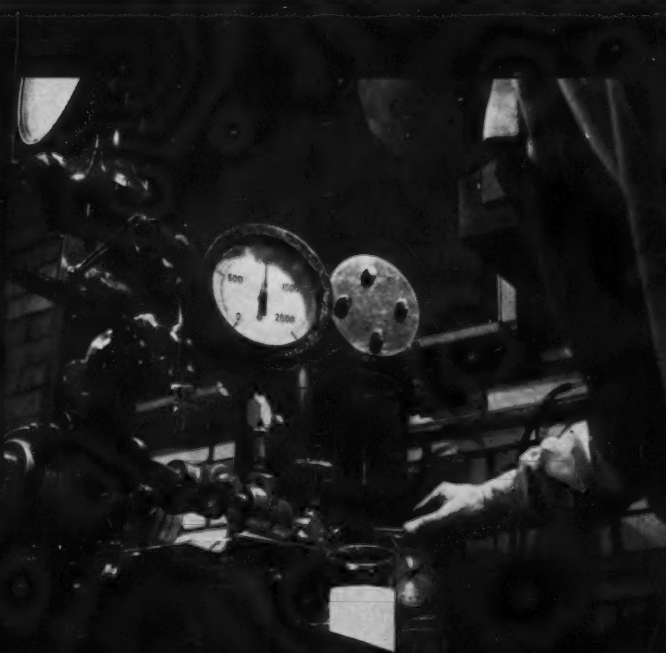
Now, the makers of world-famous Mobil petroleum hydraulic oils bring you PYROGARD D and PYROGARD R—two new fire-resistant fluids that offer positive hydraulic response *plus* improved mine safety... at low cost.

Mobil PYROGARD fire-resistant fluids are water-in-oil emulsions containing special chemical addition agents. They've been thoroughly field tested in actual mine service, and are giving excellent performance under severe conditions in cutters, loaders, shuttle cars, drilling machines and continuous miners.

The major benefits provided by PYROGARD fire-resistant fluids are detailed below. In addition you receive the help of experienced Mobil Engineers in applying them to your equipment. Their specialized know-how in the installation and maintenance of fire-resistant fluids will make the procedure sure and simple. Examine the benefits of PYROGARD fire-resistant fluids—then contact your nearest Mobil Representative.



Long-term stability in storage and use assures uninterrupted production — PYROGARD fire-resistant fluids are highly stable even at higher-than-normal temperatures—resist breakdown, foaming and water separation—keep pump parts and screens free of deposits. And with PYROGARD, water evaporation is retarded by a thin oil skin that forms when the emulsion is at rest, yet readily remixes when fluid is agitated (shown above).



Unusual flow properties assure positive hydraulic response, yet reduce leakage — PYROGARD fire-resistant fluids have unusual viscosity characteristics... resist leakage at static joints, yet give rapid flow and response elsewhere in the system. In apparatus above, a specially designed "leak chamber," introduced into hydraulic system, shows that PYROGARD leaks less than ordinary hydraulic oil.



KEEP JOBS MOVING WITH THERMOID **BIG T** CONVEYOR BELTS

NEW THERMOID PLASTICOAL PVC IMPREGNATED BELTING OUTLASTS THEM ALL! PLASTICOAL Belting is superior to all others . . . its edges wear longer, fasteners hold better and the carcass is more resistant to ripping. Tough from the inside out because every fiber is dipped in PVC (Polyvinyl Chloride) before weaving . . . then, the double-woven carcass is re-impregnated with PVC before heat-setting under tension. It exhibits superior flexibility even at low temperatures and is ideally suited for use in low coal seams. In addition, PLASTICOAL is flame resistant and flame retardant. Its corrugated surface gives better traction with less slippage than most belts, yet it requires less tension and offers easier alignment and centering. Call your Thermoid Big T distributor today for additional information on the production benefits of Thermoid PLASTICOAL Belting and other Thermoid belting in grades to fit every job requirement.



THERMOID DIVISION



H. K. PORTER COMPANY, INC.

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The man who uses wire rope knows that Leschen quality and service give best results—that Leschen Wire Rope keeps production on the move—that Leschen will make sure it's the right rope for his need. ■ To be *safe* and *sure* call your Leschen distributor for expert advice on your wire rope needs. For further details and literature, write Leschen Wire Rope Division, 2727 Hamilton Avenue, St. Louis 12, Mo.



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Porter serves industry with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

News Roundup (Continued)

Coming Meetings

Twelfth Annual National Conference and Convention, American Institute of Industrial Engineers, Inc., May 11-13, 1961—Sheraton Cadillac Hotel, Detroit, Mich.

1961 Coal Show, American Mining Congress, May 15-18, 1961—Cleveland, Ohio. Cleveland Hotel Reservation Bureau, 511 Terminal Tower (Telephone: MAin 1-4110).

Sixth Annual Appalachian Underground Corrosion Short Course, June 6-8, 1961—West Virginia University, Morgantown, W. Va.

Forty-Fourth Annual Meeting, National Coal Association, June 6-8, 1961—Mayflower, Washington, D. C.

Gordon Research Conferences on Chemistry of Coal, June 12-Sept. 1, 1961—June 12-16 sessions on Science in Preparation of Coal to be held at New Hampton School, New Hampton, N. H. For additional information write W. George Parks, director, Dept. of Chemistry, University of Rhode Island, Kingston, R. I.

Eleventh Annual Short Course in Coal Preparation June 12-July 21, 1961 — West Virginia University, Morgantown, W. Va.

Fifty-first Annual Convention, Mine Inspectors' Institute of America, June 19-21, 1961 — Penn-Sheraton Hotel, Pittsburgh, Pa.

Rocky Mountain Coal Mining Institute Meeting, June 25-28, 1961 — Hotel Colorado, Glenwood Springs.

International Briquetting Association Conference, Aug. 28-30, 1961—Jackson Lake Lodge, Jackson, Wyo.

National First-Aid and Mine-Rescue Contest, Oct. 2-4, 1961—Location changed due to uncertainty in construction schedule of Pittsburgh's new auditorium. New location will be new Civic Center, Charleston, W. Va.

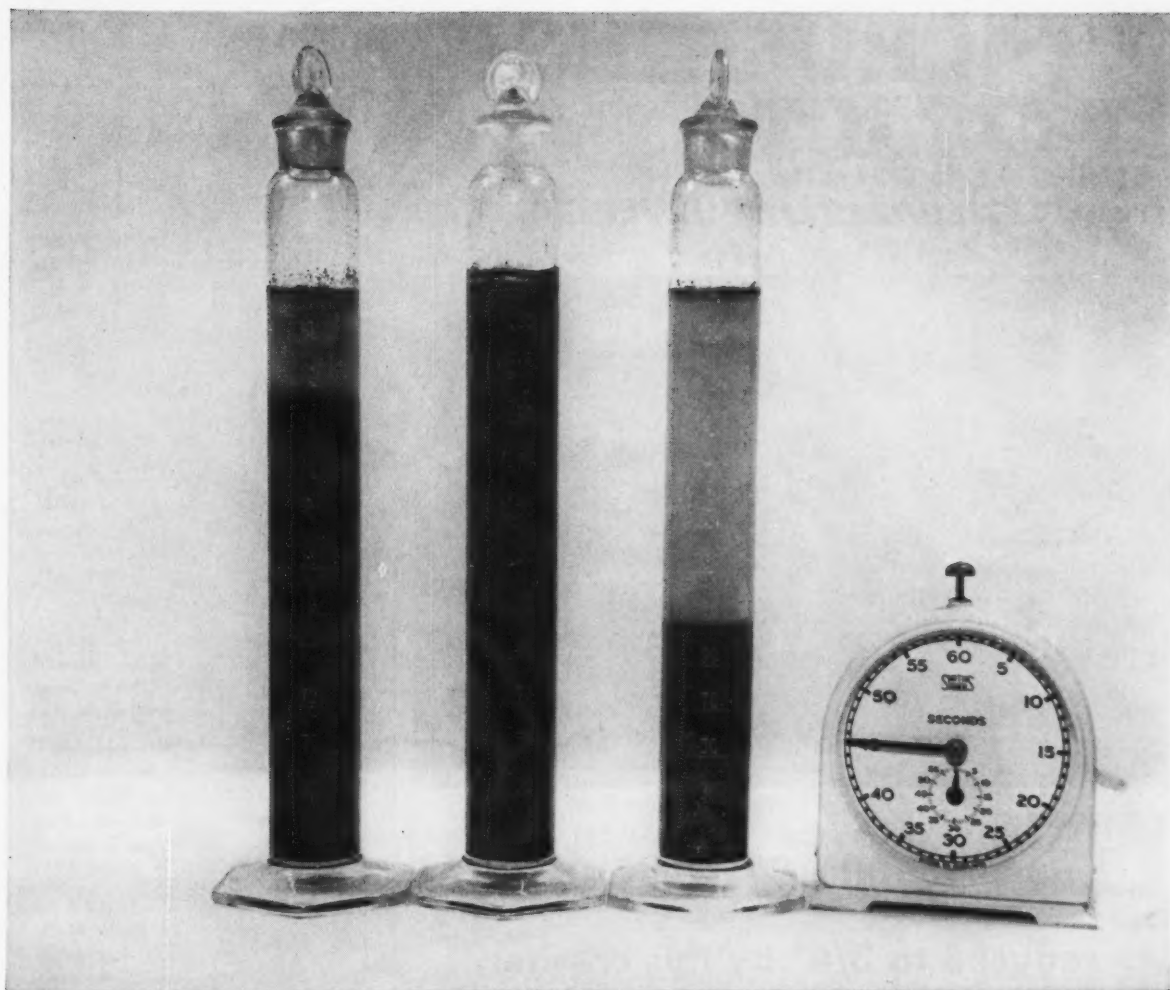
Coal Division Conference, American Mining Congress, Nov. 17, 1961—Penn-Sheraton Hotel, Pittsburgh, Pa. Coal Division Committee Meetings:

Aug. 9, Roof; Aug. 10, Mechanical Mining; Aug. 11, Haulage; Daniel Boone Hotel, Charleston, W. Va.

Aug. 22, Coal Prep.; Aug. 23, Power; Brown Hotel, Louisville, Ky.

Aug. 25, Strip; McCurdy Hotel, Evansville, Ind.

Aug. 31, Safety; Sept. 1, Research; Sheraton Park, Washington, D. C.



fast flocculation like this means clear overflow, high capacity, low cost

This photograph compares the settling rate of coal fines in water under three different conditions.

The center graduated cylinder contains coal fines and water without flocculant. There is no settling after 45 seconds.

The cylinder on the left contains starch, a material used for flocculation. There is some settling, but it is not nearly complete.

The cylinder on the right contains Separan® AP30. Notice that, after only 45 seconds, settling is nearly complete. In actual plant use, Separan AP30 has maintained clear water overflow under extremely difficult conditions.

Separan AP30 is producing settling rates of 20 to 25 feet per hour at concentrations of 0.01 to 0.20 pounds per ton of solids. Costs of 1½¢ to 3¢ per ton of solids have been reported by many plant operators. The cost of using Separan AP30 often

has been only half the cost of the flocculant previously used.

With Separan AP30, many operators have been able to maintain clear wash water overflow at high plant rates without adding expensive new equipment — thereby keeping down capital investment.

Many operators have already changed to Separan. If you have not, arrange for a demonstration at your plant right away. Just contact Dowell at 1918 Highway 41, North, Evansville 7, Indiana. The telephone number is HARRISON 5-1353. Or, contact B. E. Scott at 197 Monterey Drive, St. Albans, West Virginia. His telephone number is PARKWAY 7-2895.

PRODUCTS FOR THE COAL INDUSTRY

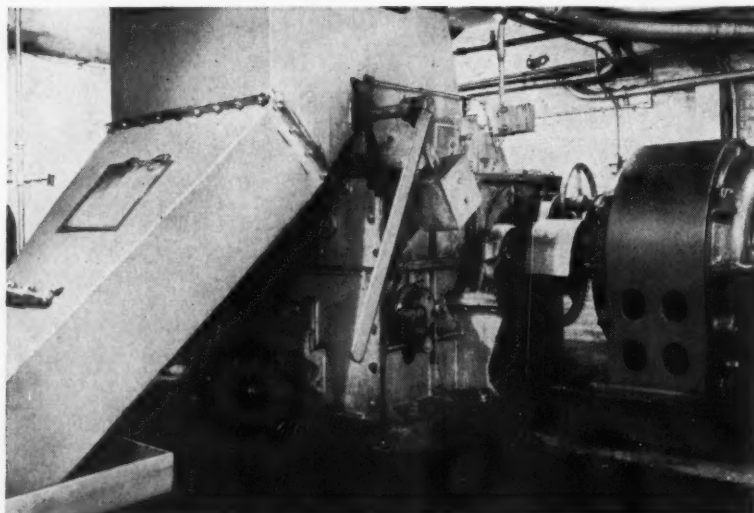


DIVISION OF THE DOW CHEMICAL COMPANY



CRUSHING FACTS

from *American* PULVERIZER CO.



USER REPORT

"7,000,000 TONS OF COAL

**reduced to 3/4" by this crusher,
and it is still going strong"**

After 23 years of operation, this American AC Rolling Ring Coal Crusher is still giving excellent service.

Replacement parts, plus standby parts, for reducing 7,000,000 tons of coal have cost less than 1/5 of a cent per ton. **Quality is proven only by performance.**

There are solid engineering reasons for this performance. The crushing elements, composed of American-originated rolling shredder rings, split coal instead of crushing it. This means less wear on screens and liners, less attrition in the crushing chamber. The rings are manganese steel and are reversible to give double wear. Liners are easily replaced.

The entire rotor assembly and bearings are so carefully machined, aligned and balanced that a nickel will stand on edge when the crusher is operating!

You can depend on performance like this when you use an American Coal Crusher. Our engineers will advise you on the correct model for your reduction problem.

American  **PULVERIZER COMPANY**
ORIGINATORS AND MANUFACTURERS OF RING CRUSHERS AND PULVERIZERS
1119 MACKLIND AVE. ST. LOUIS 10, MISSOURI

News Roundup (Continued)

Equipment Approvals

Jeffrey Mfg. Co.—Type M1-81-ALWC crawler loader; five motors, two 25-/12.5-hp, two 20-hp and one 4-hp, 440-V, AC. Approval 2F-1618A, March 2.

Acme Machinery Co.—Model SPHRD-1 rotary roof drill with integral dust-collecting system; one motor, 15-hp, 240-V, DC. Approvals 2F-1619 and 25B-82, March 2.

Jeffrey Mfg. Co.—Type MT-66 shuttle car with electrical conveyor drive; four motors, two 23-hp, one 20-hp and one 15-hp, 440-V, AC. Approval 2F-1620A, March 7.

Sanford-Day Iron Works, Inc.—Model TL5.5A transloader, powered by Cummins Model C160-B1 diesel engine for use in noncoal mines. Approval 24-38, March 7.

Getman Brothers—Models KD-52, KD-52R, KD-70 and KD-70R ore carriers, powered by Deutz Model FIL/712 diesel engine for use in noncoal mines. Approval 24-39, March 7.

Getman Brothers—Model KD-5 ore carrier, powered by Deutz Model F6L/614 diesel engine for use in noncoal mines. Approval 24-40, March 13.

Joy Mfg. Co.—Type XB36-4E extensible belt conveyor; six motors, one 60-hp, one 25-hp and four 15-hp, 250-V, DC. Approval 2F-1621, March 8.

J. H. Fletcher & Co.—Type DKC7 roof drill with integral dust-collecting system; one motor, 20-hp, 240-V, DC. Approvals 2F-1622 and 25B-83, March 15.

Long-Airdox Co.—Type TDF-15A face drill; one motor, 5-hp, 230-V, DC. Approval 2F-1623, March 16.

Compton, Inc.—Model CU61 mining machine; three motors, two 150-hp and one 100-hp, 440-V, AC. Approval 2F-1624A, March 22.

Joy Mfg. Co.—Type 2BT-2UN Twin-bore miner; five motors, two 100-hp, one 50-hp and two 20-hp, 650-V, AC. Approval 2F-1625A, March 29.

Compton, Inc.—Model CU42 mining machine; two motors, each 100-hp, 250-V, DC. Approval 2F-1626, March 29.



Only **C-L-X**[®] Continuous Lightweight exterior **Sealed Cable Systems** **by Simplex** **Can do so Many Jobs** **so Well**

Simplex C-L-X is a packaged combination of cable and an extremely pliable, corrugated metal sheath. It requires no separate duct or conduit regardless of environment. It is available with steel sheath and plastic jacketing; and with copper or aluminum sheaths, with or without plastic jacketing.

C-L-X Cuts Installation Costs

By using a single length of 3-conductor 15KV C-L-X for both underground and aerial use, a Southeastern utility company saved more than 20,000 dollars from what it would have cost for a complete underground duct system.

Resists Chemical Attack

Conduit life in this company's calcium chloride reclamation building was only 6 to 9 months. The conduit was replaced with a C-L-X cable system which — after two years of operation, shows no signs of deterioration.

Protects Against Liquids and Gases

An East Coast petroleum tank farm used a C-L-X 8-conductor cable protected with PVC for direct burial in ground that was saturated with oil, gas and water. Result: Perfect performance at a sizeable savings over conduit systems.

Only Simplex C-L-X offers you: Exceptional Strength . . . Unequalled Pliability . . . Protection from Liquids and Gases . . . Faster Installation and Lower Costs. Send for Illustrated Brochure containing Application and Engineering Data.

SIMPLEX WIRE & CABLE CO

CAMBRIDGE, MASSACHUSETTS

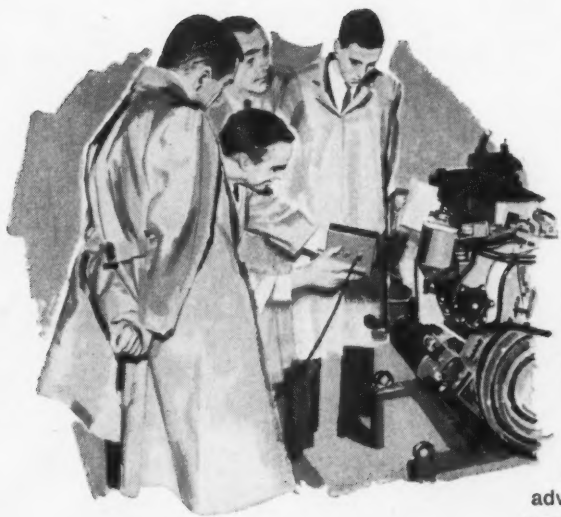
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— The American Oil Company representative who calls on you receives special training in servicing industrial and fleet customers at our Sales Engineering School. His training begins with a concentrated course in petroleum product quality and application. According to a planned schedule, he returns for an advanced course and then again for post-graduate work. — From our Marketing Technical Service Department, your American Oil representative draws assistance, when needed, from specialists who are recognized authorities in their fields. These specialists may be called in at any time to work with you on your lubrication problems. More than a thousand research scientists and technicians at our research laboratory support the effort of our representative to serve you. Their mission: To help your American Oil representative help you lower your maintenance costs and stretch your maintenance dollars. — Learn more about American Oil, its men, its service, its products.



AMERICAN OIL COMPANY
910 S. Michigan Ave., Chicago 80, Ill.

NEW R/M COALMOVER BELT

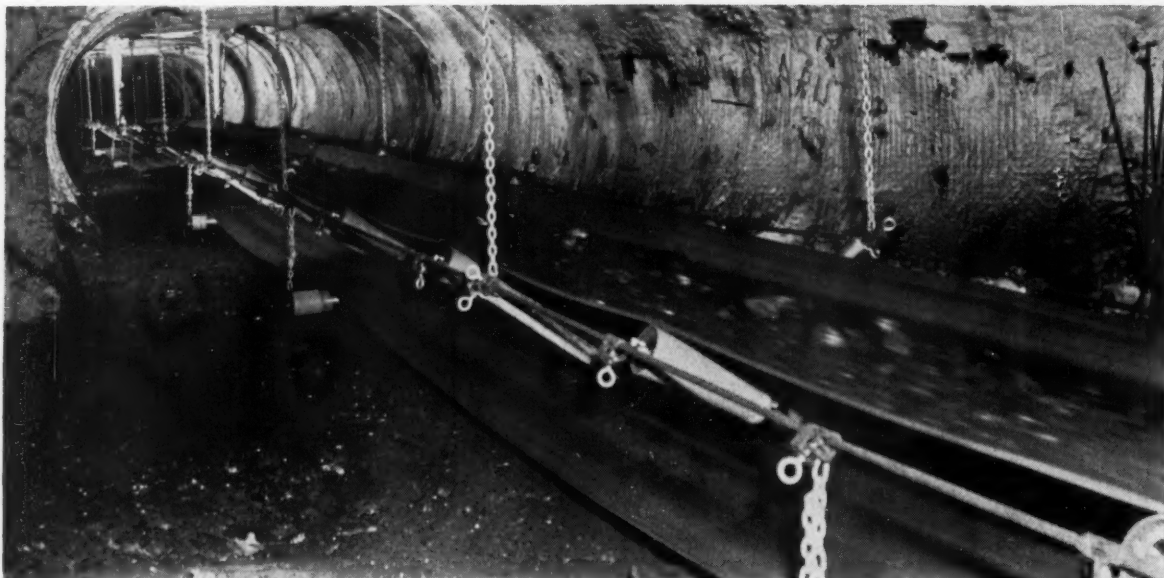


Photo courtesy Goodman Mfg. Co.

... Engineered For Mine Conveyors!

Check these belt advantages for *your* underground conveyors. Each is an engineered feature of a completely *new* belt construction for the coal industry—*all* are available *only* with new Coalmove Conveyor Belt.

R/M

How Does Your
Belt Rate?

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| <input checked="" type="checkbox"/> | LIGHT WEIGHT —easy to handle and re-spool, advancing or retreating | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | HOLDS FASTENERS —holds them <i>longer</i> , regardless of type | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | LOW STRETCH —needs only minimum take-up adjustment | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | SOLID EDGES —resists scuffing, fraying or fanning out | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> | RIP RESISTANT —maximum protection against ripping, cuts, gouging, abrasion and impact | <input type="checkbox"/> |
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| <input checked="" type="checkbox"/> | EXCEPTIONAL FLEXIBILITY —lasts longer with reverse bends and snub pulleys | <input type="checkbox"/> |
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Ask an R/M distributor to show you how R/M's new conveyor belt construction can give you "More Use per Dollar."

"COALMOVER" HAULS MORE...LASTS LONGER...COSTS LESS

RM117



RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION • PASSAIC, N. J.
ENGINEERED RUBBER PRODUCTS

Ask the man who rips the rock...



***the new ESCO ripper point
rips where other points fail!***

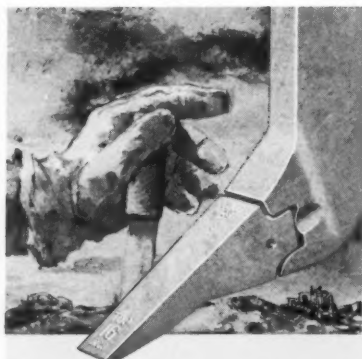
This newly-designed Ripper Point
now rips tough material that pre-
viously had to be shot.



ESCO CORPORATION,
PORTLAND, OREGON; DANVILLE, ILLINOIS

See other side for more details ➤

ESCO OFFERS YOU A POINT DESIGN AND ALLOY FOR EVERY DIGGING AND RIPPING CONDITION



RIPPER POINT SELECTION

- 14" for previously unrippable material.
- 15" for major penetration problems.
- 16" for tough production ripping.
- 18" for general ripping.
- 20" for easily ripped material.

AVERAGE RIPPER POINT LIFE IN ON-THE-JOB TESTS

	Job No. 1	Job No. 2	Job No. 3	Job No. 4
ESCO Ripper Points	5½ hours	16 hours	4 hours	56 hours
Other Ripper Points (average)	½ hour	2 hours	1½ hours	8 hours

Longer life, superior penetration, increased production—these are the three features of *ESCO's* new ripper point that mean lower costs for you. You can easily convert all your rippers to *ESCO* points. Ask your local *ESCO* dealer about cast *ESCO* shanks and *ESCO* weld-on nose pieces to convert any shank.



9 POINT TYPES FOR EVERY DIGGING CONDITION



ESCO two-piece teeth, with the widest selection of point shapes in the industry, are tailored to meet your digging requirements. *ESCO* alloy steel is used for high resistance to severe shock and abrasion.

ESCO's wear cap adapter is the most rugged tooth assembly ever developed. This exclusive *ESCO* combination of the right design, the right alloy, and the right shape makes *ESCO* two-piece teeth *right* for any digging condition.



Call your nearby *ESCO* dealer today. He's listed in the Yellow Pages. Or write direct to *ESCO*.

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Devoted to the Operating, Technical and Business Problems of
The Coal-Mining Industry



MAY, 1961

IVAN A. GIVEN, EDITOR

Added Assurance

THOUGH IT IS OBVIOUS, one still must take the time to say that the electric-utility market is one so important that almost any step that can be taken to keep it solid is worth direct and immediate attention. This includes cutting certain collateral and incremental costs involved in utility cost of using coal, including stockpiling of the necessary coal reserves.

The incremental costs, particularly those connected with coal storage, have been the objective of a special campaign in the UMWA program to advance the use of coal and thus preserve maximum

employment opportunity for its members. It has, incidentally, been well-received by utility people. A key consideration is a different approach to the question of stockpiling—an approach that contemplates relieving the utility of much of the burden and cost by doing the actual storage at the mines rather than at the plants of the users. For the utility, it means a significant cut in part of the costs of using coal—and for the coal industry it is additional assurance that it will keep the business. Anything the industry can do to get the plan actually working will assure quicker realization of the benefits.

Important Too

WHAT FUNCTIONS should the medium-recovery circuit perform in a heavy-medium coal-cleaning system? Usually one would say that removing the nonmedium solids is the most important one. Actually, it may be removal of water, since excess water cuts specific gravity faster and farther than solids buildup. But on the other hand solids buildup raises the viscosity of the medium with consequent slowing down of the separation rate and the likelihood of an inferior product.

Consideration of these points should generate in-

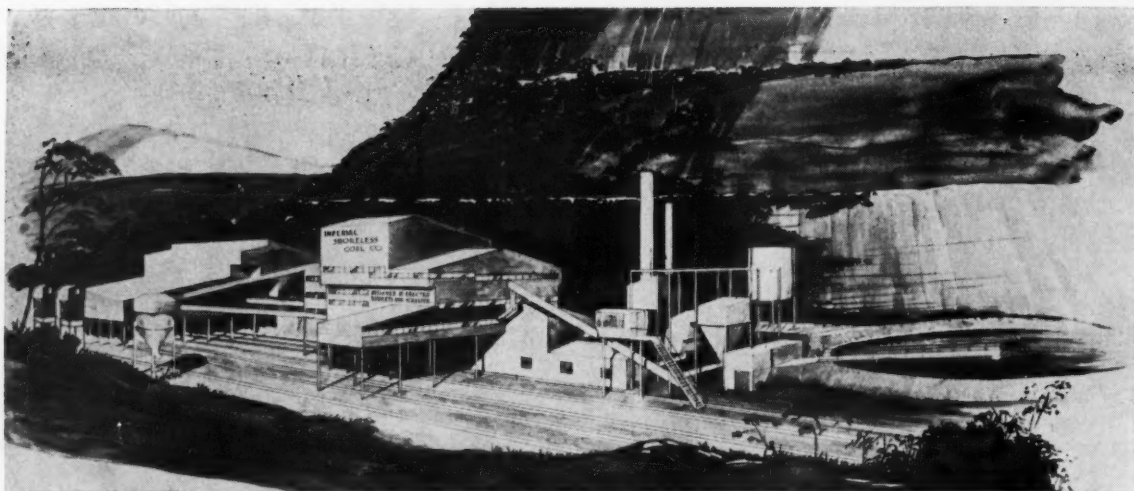
creased attention to the medium-recovery circuit. First, is it a good circuit in that it includes the proper units with the necessary capacity in the proper relation to each other and the other elements in the plant? Second, is the circuit being properly operated and maintained? Improper operation and maintenance can, of course, render ineffective even the best of circuits—and in the process degrade product quality and run up losses. So the recovery circuit should not be neglected. It, too, is an important item.

Worth Support?

COAL is not quite so involved with the federal government as most of the other mineral industries but still must give weight to what the federal establishment does or does not do in conducting its business. For that reason, it should have an active interest in the ultimate fate of H.R. 2210, offered by Representative Baring Jan. 9. The bill would create a U.S. Dept. of Mineral Resources and prescribe the functions thereof. The department, if it should come into being, would handle matters relating to

coal, petroleum and gas, metallic and nonmetallic minerals, and mineral patents and leases plus other pertinent matters.

The arguments for such a department are appealing. Foremost, of course, is the fact that the interests of the industries would be the only interests of the department, which is not the situation today. A growing number of metal and petroleum people are beginning to push the idea. Perhaps coal will want to join in.



IMPERIAL'S PREPARATION PLANT processes 600 tph of coal from its Nos. 2, 6 and 7 mines. Dual coarse-coal cleaning (jig and heavy-medium washing), wet tabling of fine coal, centrifugal and thermal drying, thickening and filtering are main features.

2½% Ash in All Sizes . . .

How Imperial Smokeless Does It

A **BOLD STEP FORWARD** in the field of coal preparation by Imperial Smokeless Coal Co., Quinwood, W. Va., has brought it decisive marketing advantages for its metallurgical coal and has assured it a stronger operating and economic future. This step also distinguishes the company as a pacemaker in effectively handling ultrafines to produce better-than-ever metallurgical coal.

Daniel Jackson Jr.
Associate Editor, Coal Age

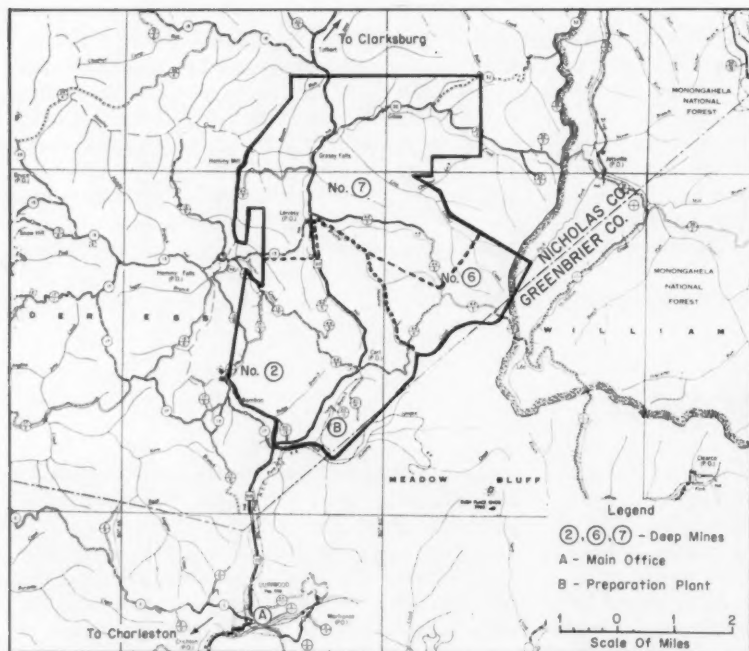
MAJOR GOALS in the design and operation of the new Imperial plant are:

1. A guaranteed maximum ash of 2½% in all sizes.
 2. Minimum degradation in the washing and screening cycles by the proper selection and use of equipment.
 3. Elimination of the human element in coal sampling by automatic sampling equipment.
- Other tangible and intangible goals include operation with a minimum of labor, elimination of stream pollution—closed-circuit water system was approved by the West Virginia State Water Resources Commission, anti-air-pollution measures, both in the plant and surrounding area, and a minimum 36-in clearance around all equipment.

The plant processes raw coal from the company's Nos. 2, 6 and 7 mines. Coal from No. 2 is delivered in mine cars while Nos. 6 and 7 coal is brought in by railroad.

Preliminary Washing, Screening

Plant feed, approximately 600 tph, is screened to remove ¼x0 coal. Plus ¼-in coal is washed in a three-com-



PROPERTY MAP shows extent of Imperial's holdings containing the Sewell seam. Reserves are estimated at 40 million tons.

The House of Sprague

"At a time when the world's economy is moving out of a period of rebuilding and into a new era of growth and expanding markets, the true measure of success of a business enterprise will be determined on the whole by the foresight and planning that has been accomplished in the years immediately past.

"Recognizing the basic truth of this philosophy, the Sprague organization has been undergoing a capital improvement program which is nearing completion in this, Sprague's 92d year. Major improvements in our coal preparation facilities, acquisition of new mining properties, expansion of our oil-marketing operations and construction of new dock and terminal facilities are just a few of the more tangible examples of this continuing effort."—Peter F. Masse, president, C. H. Sprague & Son Co.

Sprague controls the production of a wide range of superior low- and medium-volatile coals located principally in Dist. 7 in southern West Virginia. These coals range in volatile from 15% to 29%, are low in ash, of excellent inherent quality and are available in all sizes. Sprague serves the retail, industrial and particularly the metallurgical markets of the world.

With estimated total reserves of over 200 million tons and mining 25,000 tons daily, the Sprague organization is in a continuing program for further improving coal. New preparation methods, for example, are continually being developed and put into use.

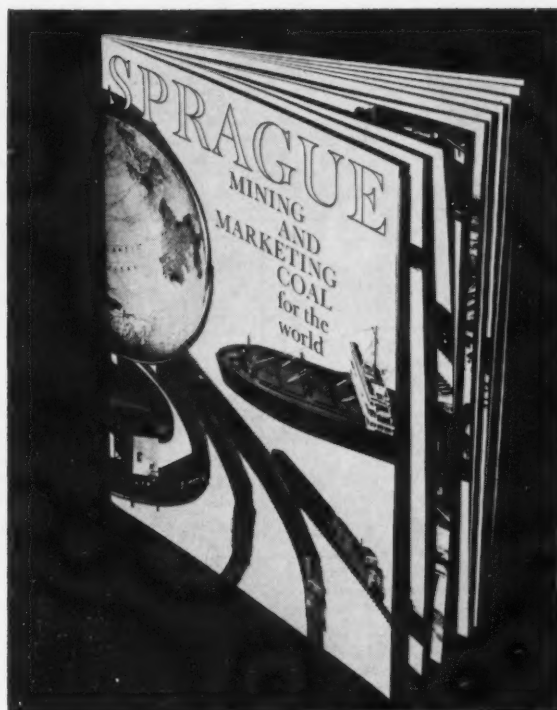
The mines producing Sprague coal are deep mines, operating in Pocahontas Nos. 3, 4 and 6 seams, the Beckley seam in the Winding Gulf field, and the famous Sewell seam in the New River and Greenbrier fields.

The Tams, MacAlpin, East Gulf, West Gulf and Winding Gulf No. 4 mines of Winding Gulf Coals, Inc., have a productive life of approximately 40 yr. Their low-volatile low-inherent-ash characteristics rank them among the finest available for metallurgical use.

The Oakwood, Lochegelly, Stanaford and Garden Ground mines of the New River Co. produce the "White Oak" New River Smokeless coal which Sprague has marketed for over 50 yr to retail dealers and industry. It still is famous for its excellence in the production of coke.

These mines are located on two of the largest coal-carrying railroads in the world—the Chesapeake & Ohio and Norfolk & Western. Coal moves to markets in the South, Midwest, New England and Canada, and to the port of Hampton Roads, Va., for coastwise and overseas shipment.

The Quinwood mines of Imperial Smokeless Coal Co., a Sprague affiliate, produces over a million tons of coal a year from properties with 40 yr mining reserves. Prepared coal from this mine originates on the N.F.&G. R. R. and can be shipped via Chesapeake & Ohio or New York Central.



Preparation Goals

Achievement of goals at Imperial's new cleaning plant was based on results from Commercial Testing & Engineering Co. washability tests on special samples of the 1½x¼-in Sewell-seam fraction at the plant and on Deister Concentrator Co. tests on the ¼-in x 60M fraction, also analyzed by Commercial Testing & Engineering, along with 60Mx0.

Goals and achievements for the various sizes are:

	Heavy-Medium, 250-tph feed	Wet Table, 250-tph feed	Flotation, 63-tph feed
Size of feed . . .	1½x¼	1½x¼	¼ in x ½ mm
Recovery (% wt)	95.5	91.8	84.0
Reject (% wt) . .	4.5	8.2	16.0
Specific gravity .	1.45	1.35	1.70
Sink in coal . . .	1.0	1.5
Float in refuse . .	2.0	5.0
Ash in clean coal	2.5	2.04	2.5

partment eight-cell Jeffrey jig. Refuse discharges onto a refuse and crushed-rock flight conveyor for delivery to another refuse flight conveyor in the new plant. The latter conveys the refuse to a new 75-ton refuse bin for disposal by truck.

Plus 1½-in coal from the washer is rescreened to remove ¾x0 degradation and then loaded into railroad cars. The 1½x¼-in coal is carried by a Jeffrey 36-in belt conveyor to a twin 6-ft (12 ft total) Roberts & Schaefer Barvoys-type heavy-medium separa-

tor for rewashing this size fraction.

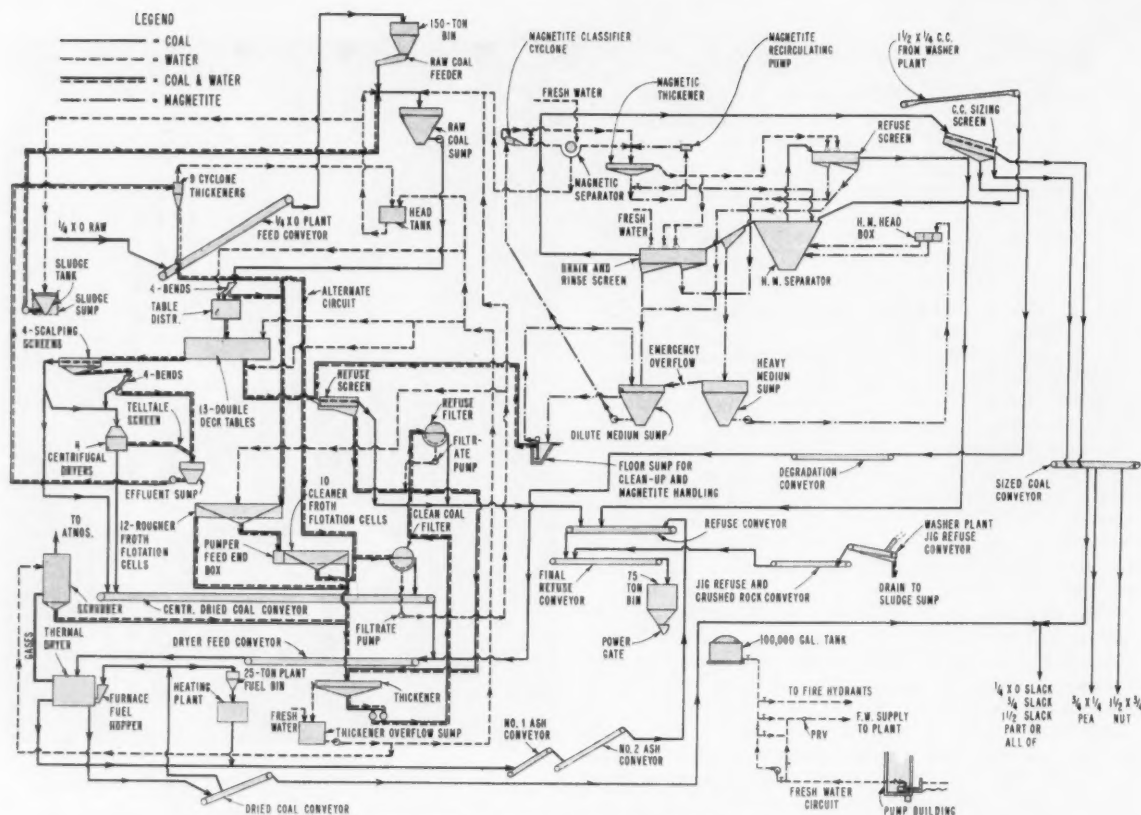
The dry ¾x0 product from the primary screens ahead of the washer is conveyed by another Jeffrey 36-in belt conveyor to a 200-ton surge bin in the new plant. The degradation (water and ¾x0) is sluiced to a raw-coal sump.

Fine-coal feed to the new plant consists of 270 tph of dry ¾x0 and 30 tph of ¾x0 degradation. Coarse-coal feed (1½x¼) is 250 tph.

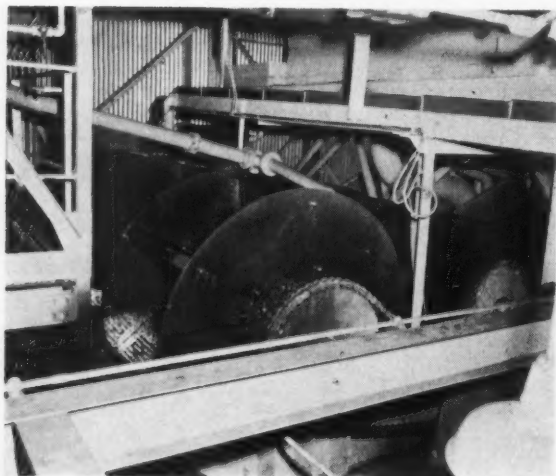
The jig-washed coal is distributed through bifurcated chutes by the

coarse-coal conveyor to the 12-ft-wide heavy-medium vessel. This vessel is equipped with two paddle wheels driven by a 7½-hp motor-reducer. The wheels propel the float coal across the surface of the heavy medium, up and out of the washer.

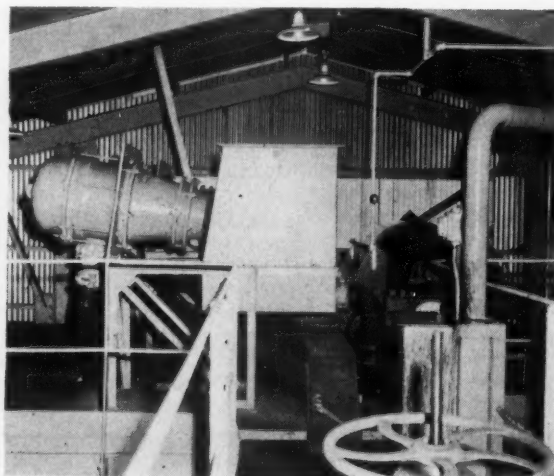
The sink material goes to the bottom of the vessel and is elevated and discharged onto a 4x16 single-deck Low Head vibrator equipped with Bixby-Zimmer stainless-steel with ½-mm and 2-mm openings. The reject is spray rinsed and dewatered.



FLWSHEET, IMPERIAL PREPARATION PLANT



HEAVY-MEDIUM WASHER re washes 1½x¼-in product from three-compartment eight-cell jig. Product is sized, loaded.



COMPLETE MAGNETITE RECOVERY CIRCUIT uses two cyclone thickeners, static thickener and magnetic drum.

Underflow goes to heavy-medium and dilute sumps. The dewatered material discharges onto a 1½x0 refuse flight conveyor, then to the final flight conveyor handling refuse from both plants.

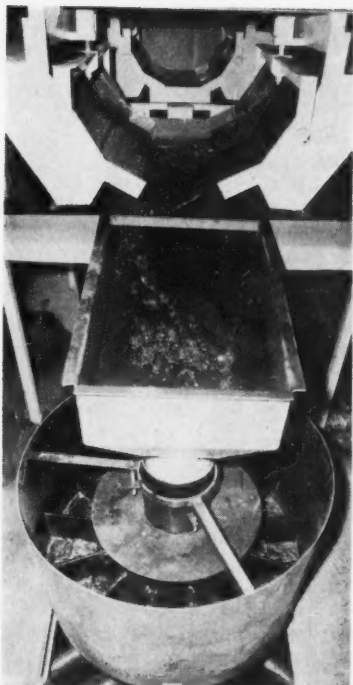
Clean coal from the heavy-medium washer passes over fixed sieves consisting of stainless-steel wedge-wire cloth with 2-mm openings for partial

dewatering. The coal then is divided between two 6x16 single-deck Low Head vibrators (234 tph total capacity) for spray rinsing and draining. The vibrators are equipped with stainless-steel screens with ½-mm and 2-mm openings.

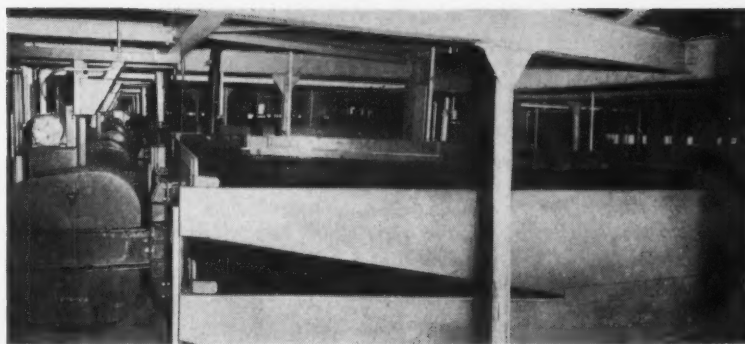
All vibrators in the plant were furnished by Allis-Chalmers. They are air-cushion-mounted, using two

small tires on each corner at 40 psi each. This method of suspension is employed by bus manufacturers to produce smooth riding comfort.

Underflow from the two rinse-and-drain screens is collected separately. Underflow from the receiving end of the screen contains the most magnetite and goes to the heavy-medium sump, as does the underflow from the



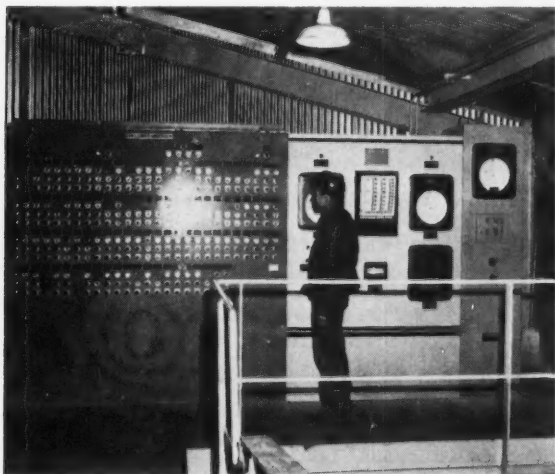
FIRST STAGE in the fine-coal circuit is to remove $\frac{1}{2}$ -mm material from the raw-coal feed. The resultant $\frac{1}{4}$ -in x $\frac{1}{2}$ -mm product is distributed by two 13-way distributors to 13 double-deck wet tables.



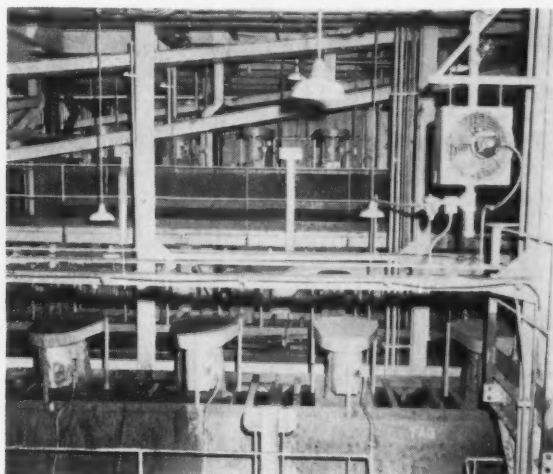
FINE-COAL CLEANING is accomplished by 26 wet tables with capacity of 270 tph.



CLEAN COAL from wet tables passes over four 4x16 vibrators to remove $\frac{1}{16}$ -in coal.



ENTIRE PLANT performs under the watchful eye of one control operator. Railroad car loading is performed by one man.



TWELVE ROUGHER FLOTATION CELLS (top) and ten cleaner cells process 63 tph of minus $\frac{1}{2}$ -mm material.

fixed sieves. This heavy medium is pumped to a head box for redistribution to the heavy-medium vessel.

Underflow from the discharge end of the screen, consisting of spray water and the remainder of the magnetite, goes to a dilute sump and then is pumped to a magnetite recovery system. The heavy-medium and dilute sumps are equipped with air purge

lines for back flushing these two units.

The magnetite-recovery system consists of two 20-in x 20-deg Roberts & Schaefer cyclone thickeners with a capacity of 1,100 gpm to classify the dilute medium; one 200-gpm Memco 30x36-in-wide drum-type magnetic separator to concentrate the magnetics in the underflow from the cyclone thickeners; and a 950-gpm 18-ft-dia

Eimco thickener which receives the overflow from the cyclone classifiers and the concentrated magnetics from the separator. The thickener is equipped with a manual lifting device and overload alarm.

Tailings from the separator are piped to the $\frac{1}{4}$ x0 raw-coal sump in the fine-coal circuit. Overflow from the thickener is used as spray water

Imperial Fact File

Daily capacity, two shifts, 8,000 tons of cleaned coal; maximum of 2.5% ash in all sizes. Rejects for 1½x¼, ¼-in x ½-mm, ½-mm x 0 sizes are 4.5%, 16.0% and 17.0%, respectively. Average hourly output of new plant is 550 tons; of primary coarse-coal plant, producing plus 1½-in, 50 tph. Shipments: Chesapeake & Ohio or New York Central.

Raw coal supplied by the company's Nos. 2, 6 and 7 mines. Coal from No. 2 delivered in mine cars; Nos. 6 and 7, in railroad cars.

Plant designed and built by Roberts & Schaefer Co. on a turnkey basis.

Coal-preparation consultant, Edward C. Carris.

Plant placed in operation 7½ mo after contract was signed; most of the construction was during winter months.

Two-station plant operation: (1) washing, tabling, screening, centrifuging, heat drying; (2) railroad loading, sampling. Five-story plant.

Floor area (concrete and grating), 25,000 sq ft.

Structural steel weight, 450 tons.

Concrete, 1,150 cu yd.

Galvanized corrugated sheeting, 50,000 sq ft; translucent corrugated sheeting, 5,000 sq ft; thermal-drying plant not sheathed except where wet coal is handled.

Steel pipe, 70 tons; extra-heavy steel pipe, 30 tons.

Electric conduit, 7.6 mi.

Electric wire, 37.6 mi.

Number of motors (Louis Allis) 123; total horsepower, 2,979. Motors are open-type frame, Design B—normal torque—units; Design C units are used where high torque is required. All motor controls (Clark Controller) are centralized in an enclosed control center with positive forced-air (pressurized) ventilation.

Outside transformer station (Wagner Electric), directly behind the new plant, supplements existing station, both supplying 4,160-, 440- and 110-V power; primary voltage, 13,000; 4,160 V supplied to 1,100 hp; 440 V to 1,879.

Light fixtures, 370; lighting load, 123 kva, designed to provide 1½ watts per sq ft of floor space.

Number of power-tool receptacles (110 V), 50.

Number of pumps (Goynne), 14; total pumping capacity, 14,425 gpm.

Amount of water evaporated by thermal dryer, 27 tph.

Drives, V-belt or chain; motors with separate Falk reducers; Dodge pulleys.

Belt and chain conveyors, 921 total ft; bearings, including angle pillow blocks, babbitted type.

Chain-conveyor speed, 100 fpm; bolted bottom plates of ¾" abrasion-resistant steel; constructed of ¼-in mild steel plates reinforced with structural shapes, and provided with 10-gage cover plates; chutes and sluices constructed of same material. Sumps fabricated with Cor-Ten steel and fitted with bottom drains and trash plates.

Flights, 24 and 30 in wide, are equipped with 2x2x¼-in angle stiffeners; 36 in and over have 2½x2½x¼-in angle stiffeners. Incline conveyors furnished with backstops on the high-speed shafts of the reducers or built into the motor-reducers.

Belt conveyors equipped with welded-steel pulleys, slip-lock hubs and antifriction bearings; 5-in Jeffrey idlers; impact idlers at all loading points; troughing idlers of the three-roll 20-deg type; counterweighted ¾-in belt wipers at each head pulley; inclined conveyor equipped with backstops.

Control center in three sections, each with 800-amp three-pole main circuit breaker; isolated in a pressurized control room constructed of asbestos cement sheeting; pressurizers (Westinghouse) are horizontal air-handling units with replaceable air filters.

Heating plant maintains 60 F rise when outside temperature is minus 20 F; Kewanee boiler with gross heat output of 2,640,000 Btu; Winkler stoker; ash-removal conveyor.

Intercom system (Mine Safety Appliances) throughout plant.

Plant equipped with five power-operated roof ventilators and three 4-ft wall louvers.

Liquid-carrying circuit color coded; fresh water, white; black-pulp, black; media, orange; dilute, yellow; clarified, green; fire system, red; steam, aluminum.

All air piping for instruments, copper tubing.

Fresh-water supply system, a 100,000-gal tank supplied from surface water from a nearby stream and second source approximately 3,000 ft from the preparation plant.

on the clean-coal and refuse rinse-and-drain screens. The thickened magnetite is fed to the heavy-medium circuit through one air-operated needle valve controlled by a heavy-medium density controller.

Two Foxboro M40 liquid-density recording controllers — one for each section of the heavy-medium vessel—are used to indicate and control the density of the medium in the vessel. Dip tubes measure the density and signal the density controller to assure constant density automatically.

Dry magnetite is stored on the ground floor of the plant and added to the heavy-medium circuit through a sump below ground level by pumping it to the dilute medium sump. The floor sump also can be used to remove plant-washdown water and spillage by pumping waste to a refuse vibrator.

A Schramm Model 105 air compressor supplies air to a Dorr-Oliver diaphragm pump, the needle valves of the magnetite thickener, and thickener underflow pumps. The compressor is equipped with a 60x20-in-dia receiver and delivers 105 cfm at 100 lb.

Clean coal from the rinse-and-drain vibrators divides on a 8x16 double-deck RipFlo vibrator for sizing the coal at ¾ in. The top deck is equipped with ¾-in round-hole-equivalent spring-steel cloth, and the bottom deck with ¾-in square-hole-equivalent stainless-steel cloth.

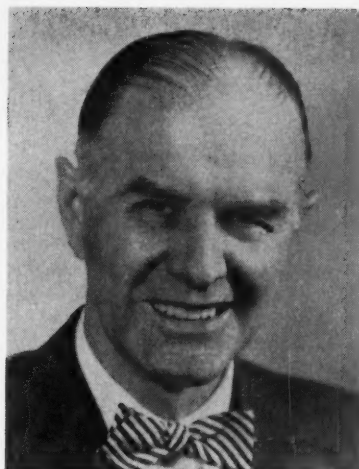
Sizes made on this vibrator are 1½x¾ nut, ¾x¾ pea and ¼x0 slack. The nut and pea sizes can be loaded separately or all or any part can be loaded with the slack from the fine-coal circuit. The small amount of slack degradation is screened out and de-

livered to a dryer-feed conveyor to the thermal dryer.

Fine-Coal Cleaning

The ¼x0 raw coal and the ¾x0 sludge from the preliminary washing and screening plant are delivered to a 200-ton surge bin and raw-coal sump, respectively. The bin is equipped with high- and low-level indicators and a 36x60-in Jeffrey vibrating feeder, which feeds ¼x0 dry coal to the raw-coal sump at a rate of 270 tph. However, the feeder is rheostatically controlled to vary the feed.

The 300 tph of minus ¼-in raw coal is pumped to four 5-ft-wide Heyl & Patterson Sieve Bends for desliming the raw-coal feed before it goes to the wet-washing tables. The Sieve Bends are equipped with feed box, universal trunnion, curved screen with 13.4 sq



EDWARD C. CARRIS, coal preparation consultant, is credited with the design and successful operation of the new preparation plant at Imperial Smokeless Coal Co. With his wealth of knowledge and experience in the field of coal preparation, he could well qualify for a PhD in this phase of mining, if such was available. There is no problem, big or small that he, himself has not tackled during his 40 some years in this field.

Mr. Carris majored in mechanical engineering. As a young man, he began his mining career with the Houston Collieries Co., serving underground, on the surface, and in the engineering and electrical departments. He later joined the research and development staff of the American Coal Cleaning Corp., moving up to assistant to the president.

He has served as preparation-plant superintendent for the American Coal Co., of Allegheny County, director of preparation for Island Creek Coal Co., assistant to the president of Roberts & Schaefer Co., and consultant.



JAMES G. MCCURRY, vice president and general manager, Imperial Smokeless Coal Co., since Jan. 1, 1955, and a director of the company since July 1, 1960, was born in Baltimore, Md., but spent most of his early life in the coal fields of southern West Virginia. He is a 1928 graduate of Logan High School and a graduate of Ohio State University, Class of 1932.

His first employment—after college—was with Tidewater Oil Co. in New York as sales engineer, but he returned to the coal industry in June, 1941, as cost-control engineer for Island Creek Coal Co., at Marianna, W. Va.

Mr. McCurry went on to become head of the industrial-engineering department of Pond Creek Pocahontas Co. in December, 1943, then was appointed superintendent of Pond Creek Pocahontas No. 4 mine in April, 1945. In January 1950, he became general superintendent of Crystal Block Coal & Coke Co., and in September, 1951, he was named general manager of Imperial Smokeless Coal Co.

ft of deck with rigid stainless-steel screen, and effluent pan.

The feed box is equipped with a grizzly screen to protect against oversized material, and baffle plates to spread the feed evenly across the screen. The universal trunnion permits the curved screens to be rotated about both horizontal and vertical axes.

Approximately 50 tph of $\frac{1}{2}$ -mmx0 material is removed and piped to 12 Wemco Fagergren froth-flotation "rougher" cells. Sieve Bends were used in this phase of the fine-coal circuit to minimize degradation, as well as to deslime raw-coal feed.

The $\frac{1}{4}$ -in x $\frac{1}{2}$ -mm product, about 250 tph, is distributed to 13 Concenco

No. 77 double-deck concentrating tables by two 13-way distributors. These distributors are equipped with wearplates and replaceable liners for the feed wells and discharge outlets. The bottom of the tank is lined with 4 in of concrete.

Refuse from the tables goes to a relocated horizontal vibrator and is dewatered at $\frac{1}{4}$ mm. Underflow goes to a 100-ft Eimco static thickener and dewatered refuse is conveyed to the refuse bin.

Clean coal from the wet tables is divided into four parts and sluiced to four 4x16 single-deck Low Head vibrators for scalping at $\frac{3}{16}$ in. Vibrators are equipped with $\frac{3}{16}$ -in round-hole-equivalent stainless-steel screens. Top

size ($\frac{1}{4}$ x $\frac{3}{16}$ -in) from the screens can be delivered to the clean-coal conveyor for thermal drying or any portion (25%, 50%, 75% or 100%) can go to the Reineveld centrifugal dryers. Normal practice is to bypass the centrifugal dryers to minimize degradation.

The $\frac{3}{4}$ x0 product is further deslimed on four clean-coal Sieve Bends to remove the remaining $\frac{1}{2}$ mmx0. These screens are identical with the four raw-coal units.

The $\frac{1}{2}$ mmx0 material is sluiced to an effluent sump. The $\frac{3}{16}$ -in x $\frac{1}{2}$ -mm coal goes to four 36-in Reineveld centrifugal dryers (one relocated from the existing plant) equipped with stainless-steel baskets, mild-steel screen plates, adjustable scraper drums and integral forced feed lubrication systems.

Underflow from the dryers discharges onto a clean-coal conveyor and effluent is passed over a telltale screen and then to the effluent sump. The telltale screen consists of 8 sq ft of stainless-steel wedge wire to protect the froth system in the event of a break in the perforated basket.

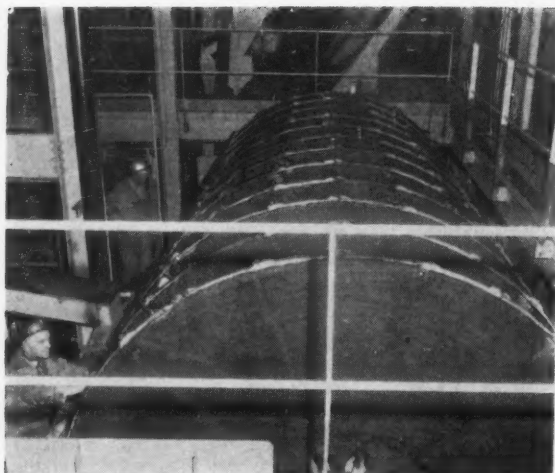
Product ($\frac{1}{2}$ mmx0) from the Sieve Bends, plus the effluent from the mechanical dryers, is pumped to nine 14-in Heyl & Patterson cyclones, three of which were relocated from the existing plant. Part of the overflow goes to the fine-coal head tank for reuse in the raw-coal sump, and part to the sludge tank in the preliminary washing circuit. Underflow goes to the froth-flotation cells. As an alternative, it can go to a 10-ft 8-in 12-disc Eimco vacuum filter equipped with stainless-steel bags having a filter area of 1,800 sq ft.

Ultra Fine-Coal Cleaning

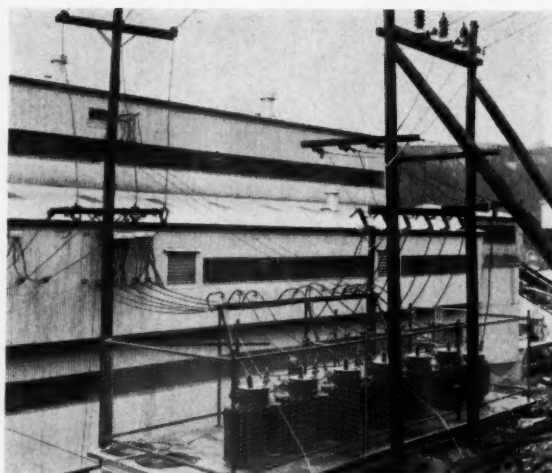
Underflow from the four raw-coal Sieve Bends goes to the 12 "rougher" flotation cells. Underflow from these cells is pumped to 10 "cleaner" flotation cells. Tailings from the "rougher" and "cleaner" cells goes to the 100-ft static thickener.

Flocculant is fed to the thickening and filtering system cells by a Milton Roy Model MDI-31-56 packaged pump-tank metering system.

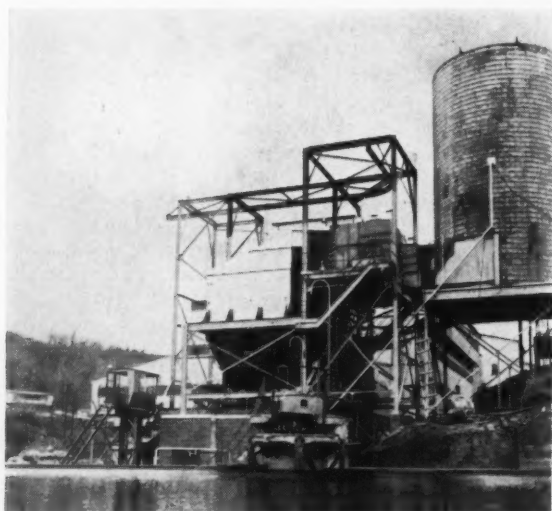
Underflow from the "cleaner" cells, plus the thickened product from the nine 14-in cyclones, if the alternate circuit is used, goes to the clean-coal vacuum filter. Filter cake discharged



CLEAN-COAL VACUUM FILTER handles product from the flotation cells. Filter cake goes to thermal dryer.



POWER CENTER provides 440-V power for 2,979 hp in the plant. The 4,160-V power is supplied from a second power center.



100 - FT - THICKENER clarifies effluent from plant. Thickened material goes to a refuse vacuum filter and overflow returns to plant.

onto the clean-coal conveyor and filtrate is returned to the $\frac{3}{4} \times 0$ sump.

The static thickener collects effluent from a thermal-dryer scrubber, underflow from both flotation cells and underflow from the wet-table refuse vibrator. Thickened material is pumped to a 10-ft 8-in Eimco vacuum filter. Overflow is pumped to the clarified-water tank and is used as dressing, pulping, scrubbing and rinsing water in the plant.

The filtrate from the refuse vacuum filter is returned to the static thickener and the filter cake conveyed to the refuse storage bin.

Fine-Coal Thermal Drying

The $\frac{1}{4} \times \frac{3}{16}$ -in from the four clean-coal vibrators, $\frac{3}{16}$ -in \times $\frac{1}{2}$ -mm product

from the centrifugal dryers, filter cake from the clean-coal vacuum filter, and degradation from the heavy-medium circuit are collected on a dryer feed conveyor and elevated to a Heyl & Patterson Fluid Bed dryer with a bedplate area of 135 sq ft. The dryer is complete with feed bin, rotary feeder and discharge valve and control instrumentation.

A Bigelow-Liptak furnace is capable of supplying 115 million Btu per hour. It is equipped with a Hoffman stoker with a 10-ton storage bin. Primary dust collection is achieved by using a Cyclo-trell dust collector manufactured by Research-Cottrell, Inc. Collected dust is conveyed to a dryer-product conveyor by a 15-ft 16-in-dia Jeffrey helicoid screw conveyor.

The dryer is equipped with a

Robinson Ventilating Co. Type A Class IV exhaust fan. Secondary dust collecting is accomplished with a scrubber. It is a concrete-stave stack with trowelled epoxy resin lining, 22x 40-ft high and equipped with sprays.

Control instrumentation includes furnace and dryer temperature-recording controller and thermocouple, high-temperature and discharge-stoppage alarm system, drying-chamber temperature-indicating high-limit controller, bed-pressure control instrument, and exhaust-fan inlet-damper remote-control system.

The heat-dried coal is conveyed to the loading chute for loading into railroad cars. The loading operation is controlled by one man in the loading tower. Air-operated chute gates direct the coal from one leg to the other of the car-changing chutes.

Railroad car handling equipment, such as, Model HKG retarders and Model HKL hoists, were supplied by Sanford-Day. Five-car layer loading can be performed for $\frac{1}{4} \times 0$, $\frac{3}{4} \times 0$ and $1\frac{1}{2} \times 0$. Standard sizes made include plus $1\frac{1}{2}$ -in lump, $1\frac{1}{2} \times \frac{3}{4}$ nut, $\frac{3}{4} \times \frac{1}{4}$ pea, $\frac{1}{4} \times 0$ carbon, $1\frac{1}{2} \times 0$ nut-slack, and $\frac{3}{4} \times 0$ pea-slack.

All sampling is done automatically by a timer or manually from the control tower to eliminate the human element. Each pants-leg loading chute is provided with two sample cutters, one for each leg. Coal samples discharge into a crusher. A portion of the crushed sample—5%, 10%, 15% or more—is collected in portable containers and delivered to the lab. The unused portion of the sample is returned to the railroad car.



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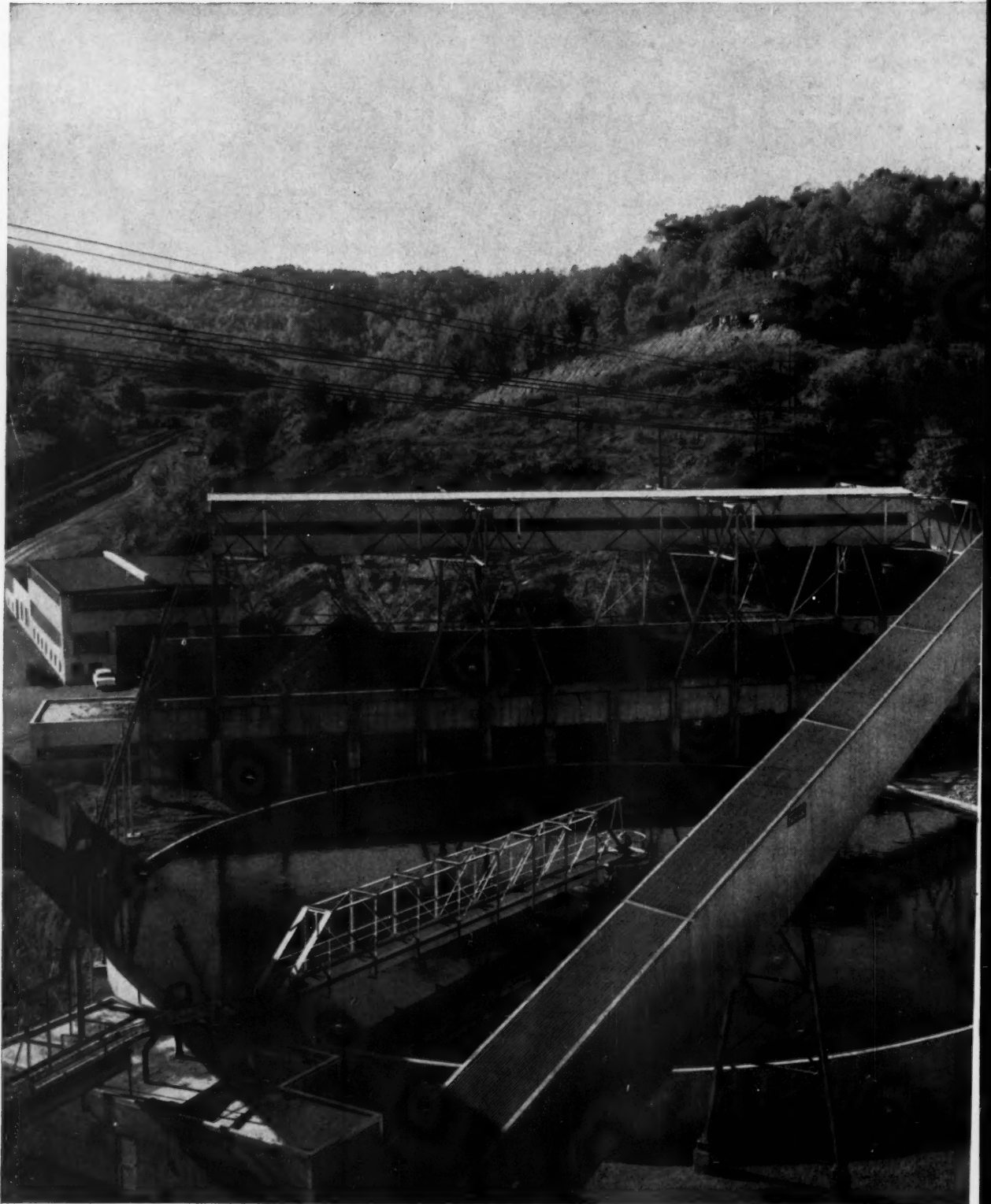
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HOW MAJOR EAST COAST MINE HANDLES

The Dorr Type S Thickener is a proven unit now widely used throughout industry.



BLACK WATER IN A CLEAN STREAM AREA

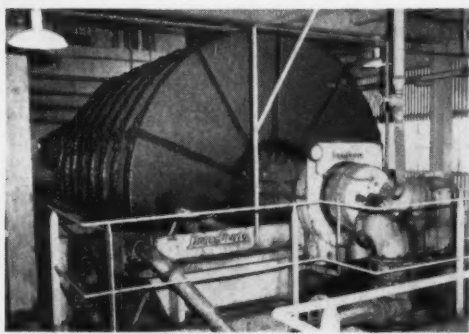
Dorr Thickener and two American Disc Filters close preparation plant water circuit

Located in an area free of industrial pollution, preparation plant water handling could have presented a serious problem at this large Northern West Virginia mine. It was imperative that no black water bled back into the creek. The problem was solved — and the water circuit closed — by the use of a 170' Dorr thickener in conjunction with two 10'6" dia. by 10 disc American filters.


Primary feed to the thickener is the overflow from the table-refuse drag tank plus other black water. 65 tph makeup water is added at the thickener — approximately the amount evaporated in the heat drying plant, giving a makeup rate of approximately 275 gpm. Overflow is piped to the plant for various uses. Underflow from the thickener goes to the two American Disc filters. Cake from the filters

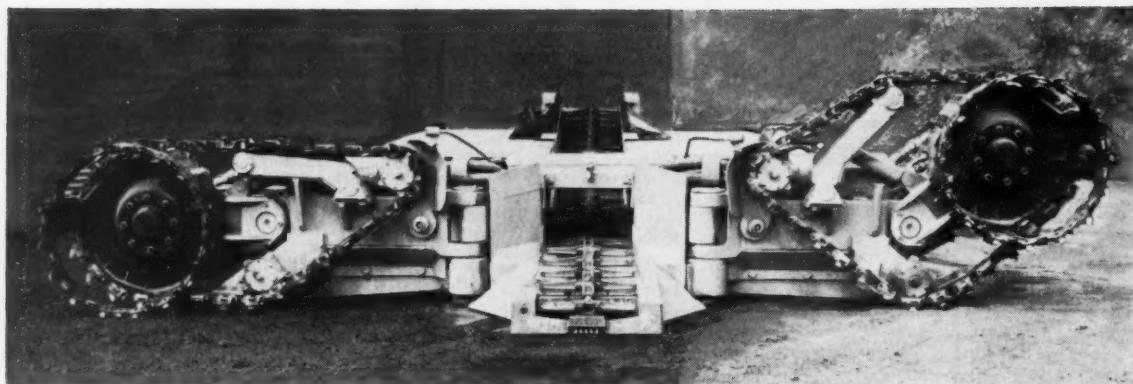
can be sent to the flash dryers or can be diverted to refuse.

Dorr-Oliver can supply a full range of equipment for coal drying, cleaning, recovery and water clarification. For complete information write Dorr-Oliver Incorporated, Stamford, Connecticut.

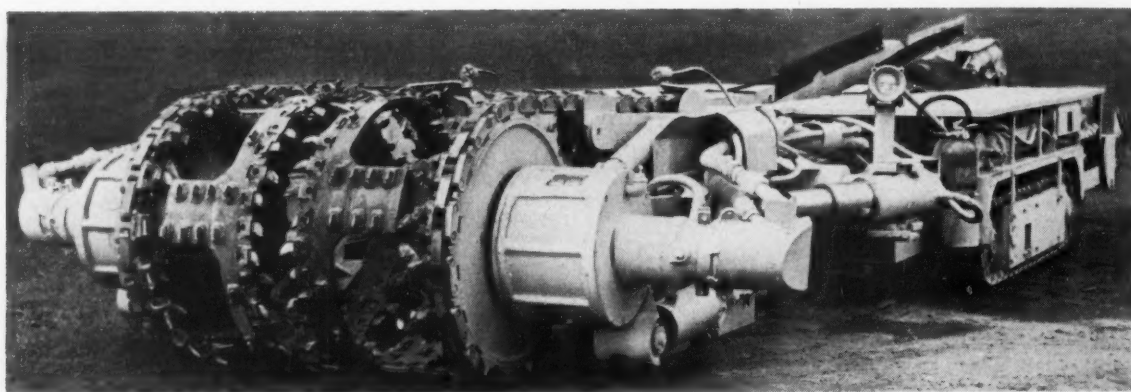


American Disc Filter features extremely large filter area for space occupied.

 **DORR-OLIVER**
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT



OPENED CUTTING ARMS cut an opening 18½ ft wide. Arms may be raised 18 in as shown in above photo to mine coal of



THIN-SEAM CONTINUOUS MINER removes coal with two barrel-type pivoting cutting heads and trim chains. Arms are shown

New Thin-Seam Continuous Miner

Unit with two barrel-type swinging cutter heads raises productivity to a new high in 40-in seam with tender roof. Percentage of fines does not increase significantly.

A 100% BOOST in productivity with no significant change in size consist is a goal in sight with a new-type continuous miner at the Harlan Fuel Co., Yancey, Ky.

Employing a Joy Compton CU 42 universal miner, a 7-man crew has mined better than 300 tons per shift from the 36- to 41-in Darby seam under somewhat less than favorable conditions. For instance, weak drawrock above the coal demands that the miner change places after 45 ft of advance, thus decreasing significantly the available productive time.

About 2 yr ago Harlan Fuel decided to tap the company's 15-million-ton reserve of Darby coal with an ex-

ploratory and experimental mine. Although the Darby seam is known to be consistently high in quality, management not only wanted first-hand information on the quality of its reserves but also on what roof conditions would be encountered. In some nearby mines a troublesome drawrock covered the coal and made mining difficult. The rock frequently came down with the coal or had to be timbered very closely. By combining roof bolting with rapid heading advancement, Harlan Fuel planned to drive an exploratory entry to learn what conditions it would face.

Results with one conventional off-track unit were encouraging and as

a result, the company expanded activities in the Darby seam. After expanding to full-scale operation with three conventional units management became interested in continuous mining as a means of increasing productivity. But since the company sells primarily to the domestic market which demands a maximum of lump sizes, management sought a continuous miner that would produce a maximum of coarse coal.

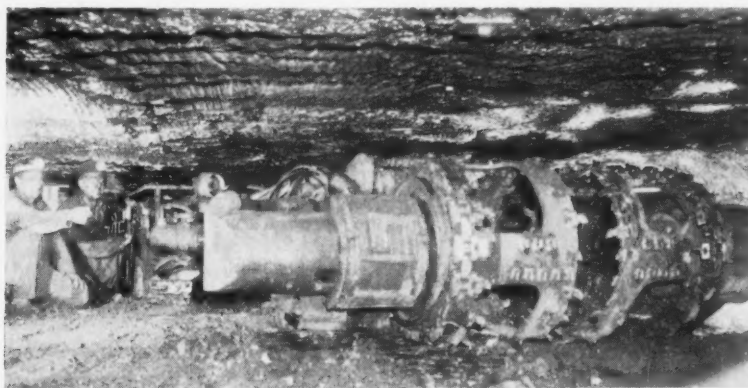
After observing a CU 42 miner in action at another operation, management decided to buy one and adapt it to conditions in the Darby seam. After arriving in September, 1960, the miner went to work developing a main entry and a room panel.

How the Miner Works

The CU 42 miner removes coal with two 32-in barrel-type cutter heads which pivot on arms connected



varying thickness. Both cutting heads are in bottom position in underground photo.



in closed position for tramming. Machine is 10 ft 2 in wide.

to the main chassis. Trim chains on the arms break top coal between the barrel heads and the pivot points. As the two cutter barrels move in arcs toward the center of the machine broken coal falls onto a chain conveyor which carries it to the end of the discharge boom.

The two cutting arms can be independently raised or lowered 18 in to mine coal with varying thickness. Each arm also may be operated independently when cutting breakthroughs or starting rooms.

A mining cycle includes the following five elements: sump, mine top portion of the seam, reopen and reposition the cutting heads, mine lower portion of seam, and reopen cutter heads. Time studies taken over 20 shifts show that it takes 2.11 min to complete this cycle at Harlan Fuel.

Average time for each element is:

Sump	0.25 min
Cut top coal	1.10 min
Reopen cutter heads	0.11 min
Cut bottom coal	0.54 min
Reopen cutter heads	0.11 min

The CU 42 miner produced an average of 0.99 tpm in solid development work and has been timed at the rate of 2 tpm in rooms.

To remove the full 40 in of coal the continuous miner makes two passes, the first at the top of the seam and the second at the bottom. At the start of each cycle both cutter arms are fully extended and raised nearly to the roof in the open position. With the arms in this position, the unit measures 18 ft 6 in wide. In each full two-pass cycle the miner removes a 14-in curved slice of coal containing 2.88 tons.

Each cutting head has 16 removable carbide bits equally spaced around its circumference and 27 clearance bits on the barrel surface. Heads are equipped with Joy Compton friction-type bit holders and Kennametal U7TV carbide bits. Each trim chain has 30 removable carbide bits.

To provide flexibility in mining coal of variable hardness, rotation speed of the barrel heads can be varied

Continuous Mining Crew

- 1 continuous miner operator
- 1 pickup loader operator
- 2 shuttle car drivers
- 2 roof-support men
- 1 foreman

How the Size Consist Compares

Size	Conventional Mining	Continuous Mining
+6 in	5%	2%
+3¼ in	15%	15%
+¼ in	50%	52%
-¼ in	30%	31%

between 0 and 70 rpm. And the speed of the trim chains can be controlled between 0 and 586 fpm.

In mining the Darby seam, Harlan Fuel finds that best results in entry development are obtained with the heads rotating at 66 rpm and in rooms with them running at 44 rpm.

All movements of the machine are hydraulically operated from a central system powered by two 100-hp 440-V AC Reliance motors. Each motor drives four hydraulic pumps and power is split evenly between the two sides to provide better balance. Variable speeds are achieved with hydraulic valving. To simplify maintenance unitized sub-assemblies are used.

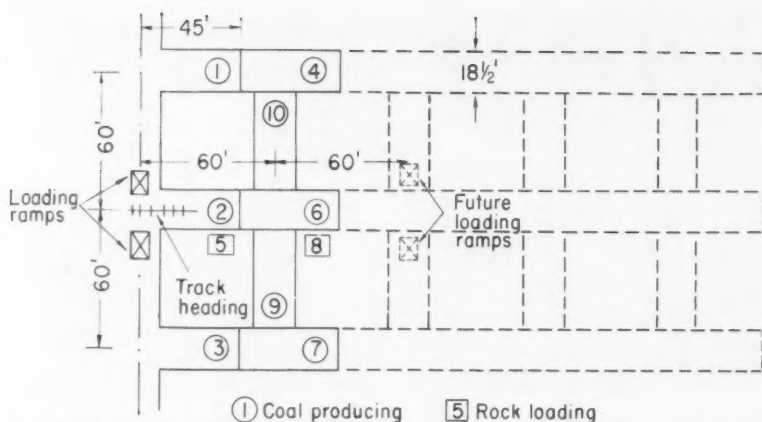
Hydraulic pressure ranges up to 3,000 psi for cutting and 1,600 psi for tramming. All hydraulic return lines are fitted with sight gages which show the loss of efficiency of hydraulic pumps. If a pump's efficiency decreases, oil flows through the gage in its return line, thus alerting the operator to potential trouble.

Over-all width of the miner with the arms in the closed position is 10 ft 2 in, length is 33 ft 6 in and height is 32 in. Tramming speed of the 22½-ton unit is 89.2 fpm.

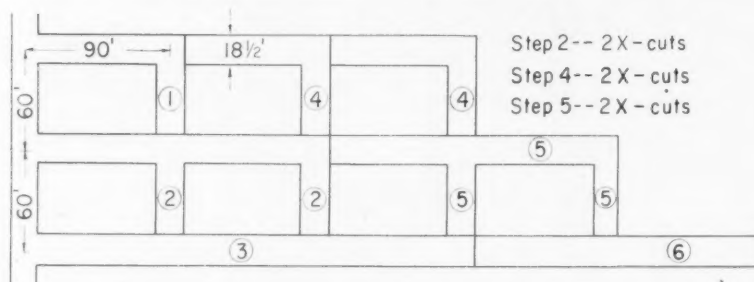
Miner Experience

To expose a minimum of roof area during development work the company's initial continuous-mining plan called for three headings on 60-ft centers to be driven to a depth of 1,100 ft and rooms developed off both sides on retreat. Heading breakthroughs were projected on 90-ft centers and the mining sequence called for the miner to advance 90 ft before moving to another heading.

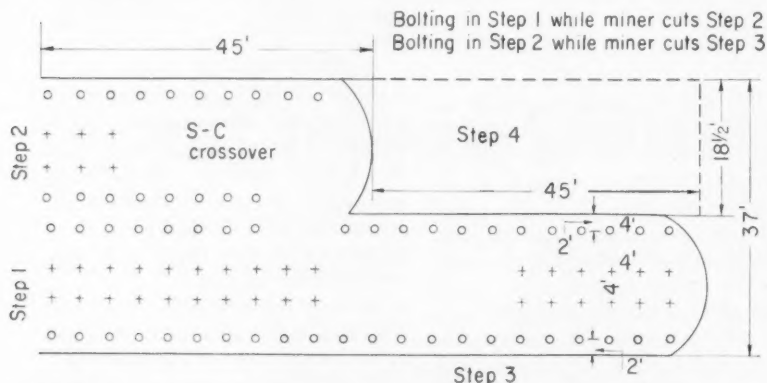
But after advancing the headings 270 ft management became concern-



LATEST ENTRY PLAN calls for continuous miner to advance 45 ft, then move to a new place so that drawrock can be bolted.



ORIGINAL PLAN included breakthroughs on 90-ft centers to keep miner moves to a minimum. Weak draw rock forced company to revise plan.



ROOM PLAN features four-step mining which provides two shuttle car roadways. Miner alternates from side to side, making 45-ft advances.

ed about advancing 90 ft with only straight posts to support the roof. As a result, distance between breakthroughs was cut to 60 ft and a new mining sequence developed whereby the miner would advance only 45 ft in solid coal before changing places.

Today's 10-step entry-development plan proceeds as follows:

1, 2, 3. Drive each of the three headings 45 ft, beginning at the left or No. 1 heading.

4. Drive No. 1 an additional 45 ft.

5. Check bits and oil level of continuous miner while pickup loader removes shot drawrock in No. 2.

6, 7. Drive Nos. 2 and 3 headings an additional 45 ft.

8. Check bits and oil level of continuous miner while loader removes 45 additional ft of drawrock in No. 2 heading.

9. Cut breakthrough on 60-ft center from No. 2 to No. 1 heading.

10. Cut breakthrough from No. 2 to No. 3 heading.

Harlan Fuel Management Team

Charles Guthrie, senior partner
Norman Yarborough, general manager
Stanley Fee, superintendent
Royal Nelms, mine foreman
William Mathis, master mechanic
Logan Seals, preparation foreman

How Yancey Stoker Coal Analyzes

	As Received	Dry Basis
Moisture	3.55%	
Ash	2.60%	2.70%
Volatile Matter	35.99%	37.71%
Fixed Carbon	57.86%	59.99%
Sulphur	0.47%	0.69%
Btu	13,941	14,454
Fusion Temp.	2,340 F	
F. S. I.	No. 3	

Other section equipment includes a Joy 14-BU loader, two 8-SC shuttle cars and a C-P roof bolter.

Shuttle cars discharge directly into mine cars traveling on track in the No. 2 heading. To minimize haulage distances, unloading ramps are installed on both sides of the track. These discharge stations are moved up every 120 ft.

The continuous miner is now driving a pair of rooms on 60-ft centers to establish a bleeder for the entry. Rooms are being driven machine width, or 18 1/2 ft, and the pillar between them will not be recovered.

Future rooms will be driven double width by making two passes with the continuous miner and will have a double roadway with a passover for shuttle cars. Each roadway will be advanced alternately a maximum of 45 ft to permit roofbolting on 4-ft centers in the center of the place as quickly as possible.

Supporting the Roof

While the continuous miner is making a 45-ft advance, straight posts with headers are set on 4-ft centers and 2 ft from each rib. As soon as a 45-ft advance is completed and the miner has trammed to a new place, a two-man crew installs two lines of bolts on 4-ft centers in the middle of the roadway. Employing a Chicago-Pneumatic electric rotary unit, these men install 30-in Bethlehem and U. S. Steel 5/8-in high-tensile expansion type bolts fitted with Ohio Brass expansion shells. This combination of timber and bolting provides support on a maximum of 4-ft centers and has



PLANNING Yancey mining activities are Charles Guthrie, senior partner, and Norman Yarborough, general manager.



PREPARATION PLANT has dense-medium washer, wet tables, dryer, crushers, and blending and oil-treating facilities.

proven effective in holding the draw-rock.

In setting up a mining plan and an AC power system for the continuous miner, the company notes that the Kentucky Department of Mines and the U. S. Bureau of Mines cooperated fully and offered many helpful suggestions. The 4,160-AC power is carried underground by armored cable to a Wagner nitrogen-filled transformer that steps it down to 440 V for operating the continuous miner. A Joy power center provides protection in the working area.

Preparing the Coal

Mine cars discharge into a hillside storage bin for transfer to cars on track at a lower level slightly above the elevation of the preparation plant's loading tracks. The mine cars travel around the hillside on the lower level and discharge into a 1,000-ton storage bin that feeds the preparation plant. A 60-in belt, equipped with a Dings magnetic pulley, carries the raw coal to the top of the preparation plant where it discharges into a 9x42-ft shaker which is divided to handle both raw and clean coal.

This unit separates the feed into plus 6-in block, 6x1 and 1x0 sizes. The plus 6-in is handpicked as it drops onto a loading boom leading to the railroad car. The 1x0 passes to six Simplicity vibrators for separation into 1x $\frac{3}{8}$ and $\frac{3}{8}$ x0 fractions.

The $\frac{3}{8}$ x0 flows to three Deister Concentrator Twin-Deck wet tables

and the 1x $\frac{3}{8}$ recombines with the 1x6 from the primary shaker. After splitting into two streams the 6x $\frac{3}{8}$ feeds onto two 6x16-ft Simplicity prewet screens that discharge into a Daniels DMS heavy-medium washer making a separation at 1.50 specific gravity.

Clean 6x $\frac{3}{8}$ passes over two 6x16-ft Simplicity triple-deck dewatering and rinsing vibrators equipped with Bixby-Zimmer $\frac{3}{4}$ -mm stainless steel cloth on the bottom deck. These units make a separation into 6x $\frac{3}{8}$, $\frac{7}{8}$ x $\frac{3}{8}$, $\frac{3}{8}$ x $\frac{3}{4}$ mm and $\frac{3}{4}$ mmx0 sizes. The $\frac{7}{8}$ x $\frac{3}{8}$ flows directly to a loading chute where it is treated with hot oil as it drops into the car. The 6x $\frac{3}{8}$ returns to the clean-coal side of the primary shaker where it is separated into 6x3 $\frac{3}{4}$ and 3 $\frac{3}{4}$ x $\frac{7}{8}$. The 6x3 $\frac{3}{4}$ passes to the egg boom for loading.

The 3 $\frac{3}{4}$ x $\frac{7}{8}$ splits and flows to Jeffrey and Link-Belt single-roll crushers and is reduced to $\frac{7}{8}$ x0. Two Allis-Chalmers 6x16-ft Ripl-Flo vibrators separate the $\frac{7}{8}$ x0 into $\frac{7}{8}$ x $\frac{3}{8}$ and $\frac{3}{8}$ x0 which join other streams of these sizes and pass to the loading tracks.

Clean $\frac{3}{8}$ x0 from the tables flows to a sump and then is delivered to a 5x16-ft Lecco dewatering vibrator equipped with $\frac{1}{2}$ -mm screen cloth. The dewatered product flows to a CMI centrifugal dryer and then is loaded into railroad cars.

Underflow from the dewatering vibrators flows to two banks of three Heyl & Patterson cyclones. Underflow from these units passes to the CMI

dryer and the overflow goes to a drag tank. Solids from this tank are delivered to the CMI dryer. Overflow from the settling tank is pumped to a settling pond.

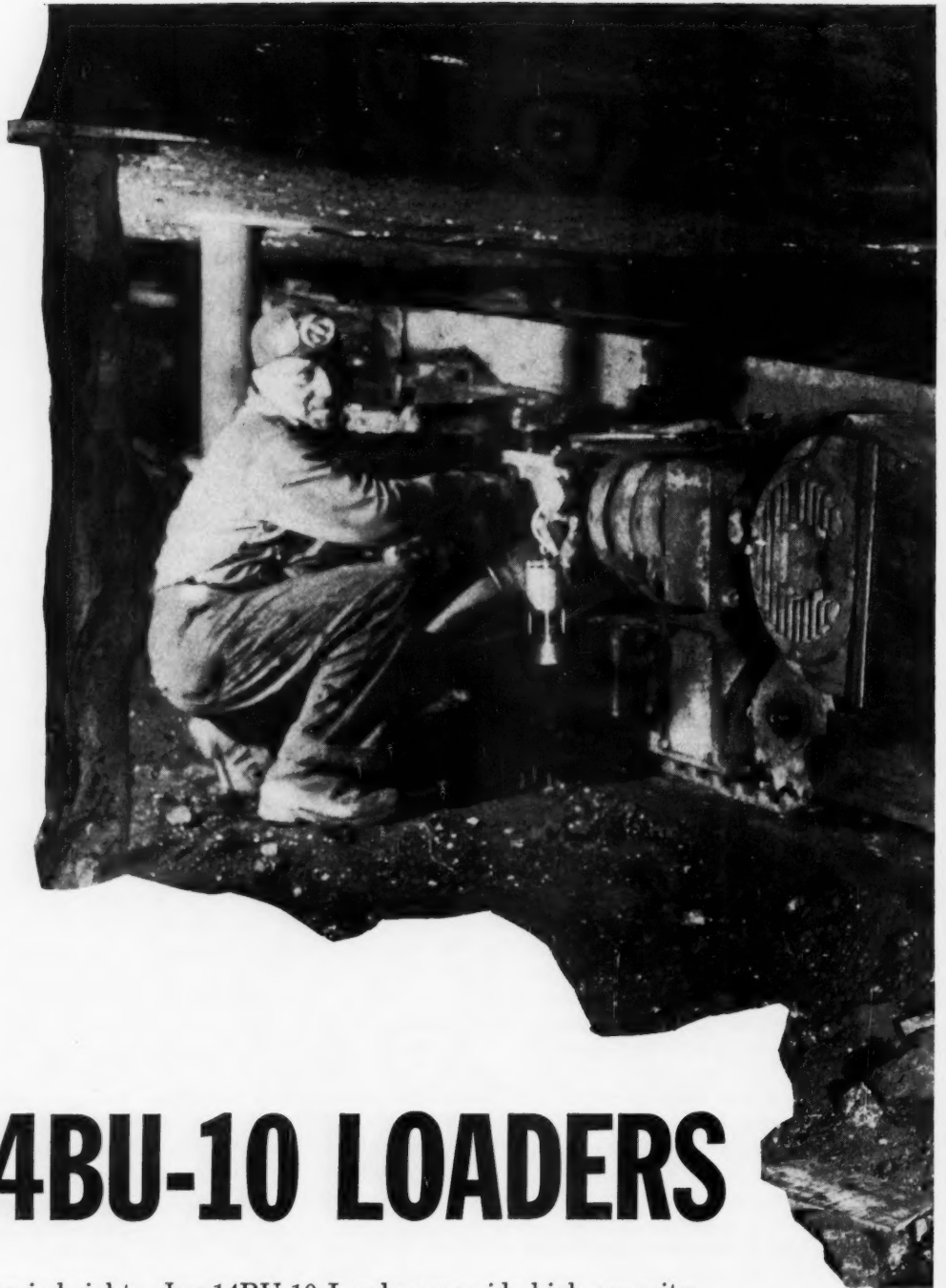
Refuse from the dense-medium washer passes over an Allis-Chalmers Low-Head dewatering and rinsing screen and then is carried to a storage bin for removal by truck. Table refuse passes over a 5x16-ft Lecco-Vib unit equipped with Bixby-Zimmer $\frac{1}{2}$ -mm stainless steel screen cloth and then flows to the refuse storage bin. Water from the refuse dewatering units is delivered to a settling pond and then is pumped to old mine workings.

Underflow from the clean-coal rinse and dewatering screens flows to a sump and is delivered to a pair of Stearns permanent-type magnetic separators. Reclaimed magnetite returns to the washing circuit and clarified water flows to the prewet screens. A separate Stearns magnetic separator handles underflow from the refuse rinse screens.

In addition to making the company's regular assortment of sizes, the plant design permits various combinations of sizes to be made to meet market conditions or customers' needs. The Daniels Co. and Adler F. Castanoli cooperated in the design and construction of the plant.

Harlan Fuel's coal is marketed by Randell Fuel Co. in the south, Republic Coal & Coke Co. in the mid-west and Bursick Coal Co. in Canada and Michigan.

RUGGED . . .



JOY 14BU-10 LOADERS

Available in three basic heights, Joy 14BU-10 Loaders provide high capacity loading for any seam. Rugged construction and generous horsepower keep the 14BU-10's loading at full capacity shift in—shift out with a minimum of maintenance and downtime. Good cleanup and fast tramming action make them highly effective in any seam condition. Your only problem with Joy 14BU-10 Loaders will be finding haulage equipment to keep up with them. Consult your Joy representative for complete information on these high production loaders, or write for Bulletin 3030-1.

MANEUVERABLE



**WORLD'S LARGEST MANUFACTURER OF
UNDERGROUND MINING MACHINERY**

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company
(Canada) Limited, Galt, Ontario





BELT-CONVEYOR REPAIR SERVICE provides operating and economic stability to companies that take advantage of commercial facilities. Estimating cost of repair and reconditioning by service shops eliminates guesswork.

How to Use . . .

Belt-Conveyor Repair Services

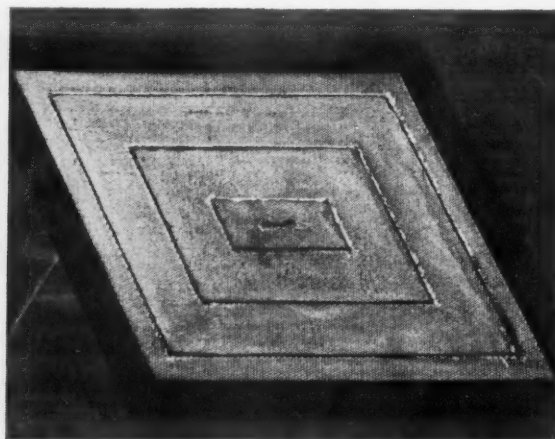
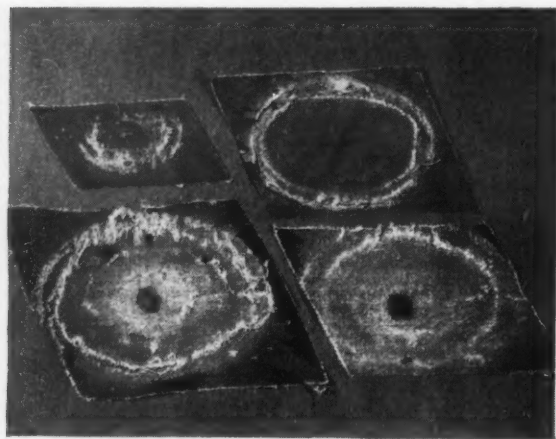
Operating and economic advantages of belt-conveyor repair services are well established but the introduction of solid-carcass belts has overshadowed the need to continue repair policies, though the need is as great today as it was yesterday in achieving full operating economy.

THE LARGEST SINGLE COST ITEM in a belt-conveyor system is the belt itself—some 40% to 60% of the initial cost. Before a belt is dis-

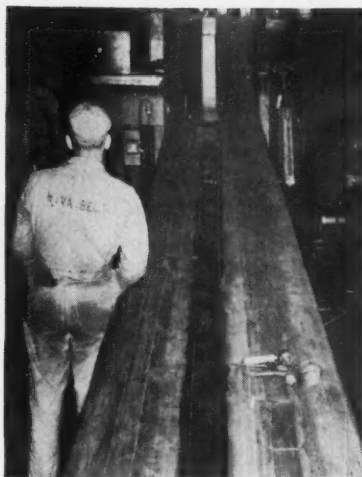
carded because of damage and wear, or a decision is made merely to replace it with the new solid-carcass type, the cost of having it repaired

to first-class condition should be considered. The difference could be from one-eighth to one-half the price of a new belt.

Estimation and actual reconditioning may be done by the coal company or by an independent service shop. One example of the latter is West Virginia Belt Repairs, Inc., Mt. Hope, W. Va., one of the pioneer companies offering this service to coal. Its facilities and methods, like those of other good service shops, are designed to provide the best in repair and reconditioning at minimum cost.



MILDEWED SECTIONS (left) were removed from the belt section shown at right. New material of the same weight and thickness was used to make the repair. Material is removed on a staggered basis to eliminate cuts being on top of each other.



300-FT RIP spliced under pressure. It trained as well as the original in service.

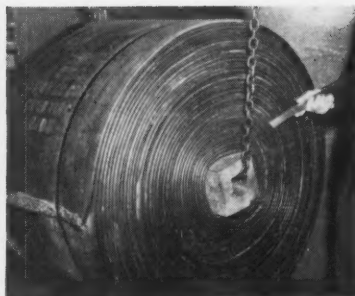
The services include an accurate estimate of the cost of repair and reconditioning. The advantage is that mine management can accurately determine whether it is more economical to have the belt repaired or replaced. Guesswork is eliminated.

The pros and cons of ply and solid-carcaass belts, both application and performance, have been the subject of much discussion in recent years. As a result, belt manufacturers and users are concluding that both types will be widely used. This conclusion is based primarily on the fact that belt applications cover such a wide range of conditions and uses that neither type contains all the elements needed by an all-purpose belt. This conclusion, however, is not unanimous.

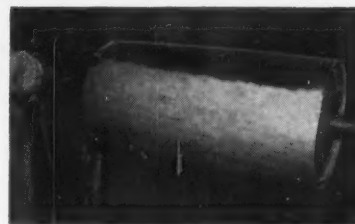
There is a tremendous footage of ply belting in service and it is still being recommended for many applications. Solid-carcaass belting has gained recognition as an excellent performer and certainly will take its share of the belt market. It has in fact jumped to first place in sales.

Almost every mine that uses belt conveyors has a mixture of ply and solid-carcaass belts. There is room for both types with each providing the user with the maximum operating advantages for his particular installations.

Operators who are changing from ply to solid-carcaass belts are faced with the problem of what to do with the ply belt on hand. Should they standardize by scrapping their ply belt whether worn out or not? If the



PATENTED NEOPRENE EDGE after completion. The curing does not require vulcanization, yet is extremely durable.



GRIT-BLASTING CHAMBER is used to clean idlers and drive pulleys before vulcanized lagging is applied to metal.

belt was not worn out, scrapping would be an economic mistake. The investment has been made and the company should receive full value. The average life of a ply belt that is properly maintained and repaired is from 7 to 10 yr. Both the conventional rubber and the fire-resistant neoprene belts are repairable.

An accurate repair-cost analysis is important. Factors to consider are the repair cost and belt performance after repairs are made. Normally, permanent repairs are confined to ply-type belts. Solid-carcaass belts cannot be mended as easily. They can, however, be vulcanized but the process is not economical except for special applications.

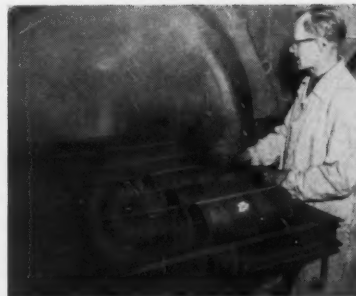
Repair-Cost Analysis

West Virginia Belt Repairs, Inc., makes a repair-cost estimate on all belts before any work is done. This complete estimating job is on a no-charge service basis. Here's how and why they do it.

1. Belt sections are picked up at the mine and delivered to the shop.

2. Each section is checked on a 60-ft inspection table equipped with slow-speed spooling devices.

3. Both sides and edges are inspected for punctures and edge wear.



IDLER PULLEYS being removed from pressure chamber designed for large diameter drive pulleys.

4. All rips, gouges, edge wear and moisture content are recorded on an inspection form (see illustration) noting size and extent of damage.

5. The report, which contains all the information on work necessary to put the belt in first-class condition is sent to the estimating office.

6. A statement of the cost is sent to the coal company. If the cost is favorable the company orders the repairs; if not, the belt is returned to the mine.

Belt Repair

When a belt is to be repaired, these are the steps West Virginia Belt has found lead to the best results: Each section of belt is placed in an oven to remove excess moisture. Caution is exercised to make sure that the moisture content has been brought to the proper level. If it is too dry the carcaass material might lose its strength. This is determined by a moisture meter.

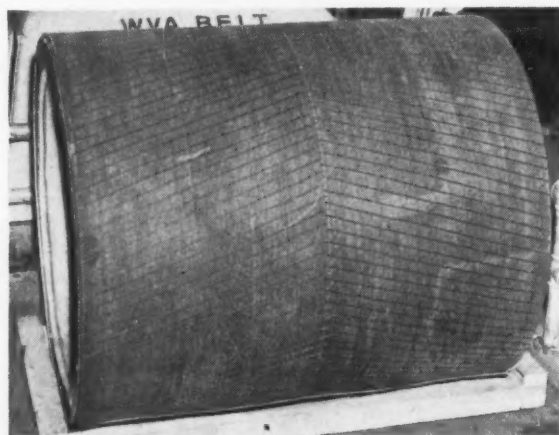
After the belt leaves the oven it is placed on one of eight 60-ft tables where the repair work is performed. Fifty vulcanizers of various sizes and types and associated equipment are available for repair work. Many vulcanizers have been made locally for special work since commercial machines are not available. Damaged material is removed from the belt on a staggered basis so that no two cuts are on top of each other, is replaced with new material of the same weight and thickness and then is vulcanized. Removing and replacing material requires great accuracy if the belt is to train properly and have near-original strength when returned to service.

If several short sections of belt are sent in for repair and the coal company wants one complete section,

Maintenance Ideas



PROCESSED DEICER PULLEYS to be shipped to the mine.



HERRINGBONE GROOVING prevents belt slippage and increases belt life. Extra large pulleys can be lagged.

sections are spliced and vulcanized. Belt ends are squared and sealed, and mechanical fasteners are installed when requested.

When edge wear is excessive and the plies of the belt are separated, one of two repair methods may be used:

1. Use a built-up-edge repair where it is necessary to remove from 5 to 7 in of cover stock and ply material. Replace same with new material and cure. This is one of the costlier types of repair but will provide a full-width belt.

2. Cut off the edge by machine to where plies are still solid and then reseal the edge, either by using new gum on top, bottom and edge, and curing, or by a cold-edge patented process which is extremely durable and much less costly.

The loss of belt width will depend strictly on damage to the belt. Normally it is only $\frac{1}{2}$ in per side. If however, edge damage is excessive, then Method No. 1 must be used or the belt must be reduced in width, such



PULL TEST on test pulley shows the rubber separating from itself rather than separating from the metal.

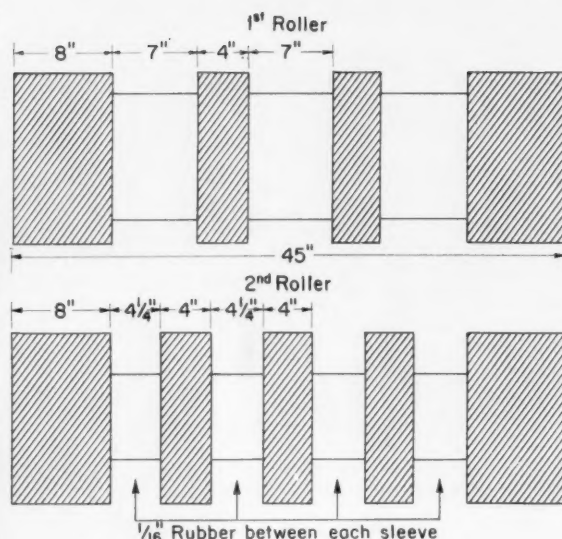
as, 36 in to 30 in. Many users have found this to be a most-economical way to get the "last squeal" from their belts and a very cheap method of providing narrow belt for underground or tippie use. For any type of edge repair the repair must be made from point where carcass is still solid. Internal stresses created by separated plies will destroy rapidly any repair not so made.

West Virginia Belt also is equipped

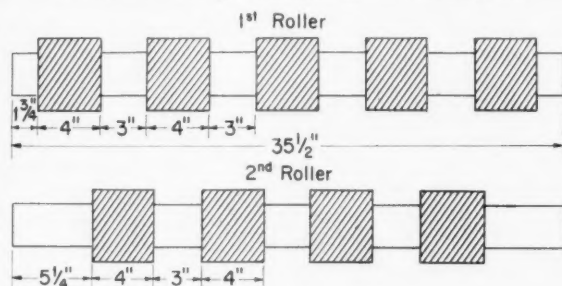
to do on-the-job splicing and repair work when necessary.

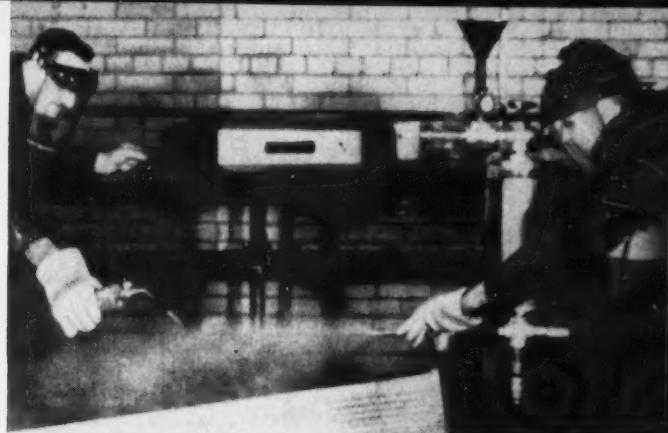
For pulley lagging it has a complete shop with grit-blasting equipment and a pressure chamber to bond rubber to metal. The pressure chamber can handle pulleys as large as 48 in in diameter with 62-in faces. Belt idlers are being equipped with vulcanized lagging (see illustrations) to prevent icing and corrosion. The deicer (return) idlers were designed by a major coal producer. The effectiveness of the idlers keeping ice off the belts and eliminating corrosion, a result of the protective rubber or neoprene coating, saves the company several thousand dollars annually.

Deicer idlers are made with two configuration patterns so that the sleeves on the idlers do not track each other but actually distort the belt slightly. This idea has been extended to carrying and return idlers used where corrosion is extremely high. A smooth bonded rubber coating covers the entire surface of the idler.



TWO DESIGNS for deicer pulleys. Pulleys are installed in sets of two and have proven successful in removing ice.





Conventional hydraulic fluid burns fiercely when sprayed into flame. Shell 3XF hydraulic fluid does not burn in identical test. It's safe.

PHOTOS COURTESY U.S. BUREAU OF MINES

BULLETIN:

Shell Research forces water into oil to produce an economical, fire-resistant hydraulic fluid for mines

Hydraulic mine machinery is run by electricity. A short circuit can start a fire. The flames can melt a hydraulic hose and feed on a conventional fluid.

New Shell 3XF® Mine Fluid, mixed with water, reduces this risk. It is an economical, water-in-oil emulsion that resists fire.

Read how this product of Shell Research became the first fire-resistant hydraulic fluid to be approved by the U.S. Bureau of Mines under Schedule 30.

WITH THE invention of Shell 3XF Mine Fluid, the danger of underground mine fires can be greatly reduced.

Here is the story of how Shell scientists developed this remarkable product:

Mineral oil, they knew, is an excellent hydraulic fluid. But it burns. Water is an excellent fire extinguisher, but not the best lubricant.

Why not find a way to combine the two? Oil for lubrication, water for safety. No simple task. But Shell Research did it.

They did it by perfecting a unique kind of water-in-oil emulsion. The water was literally forced into the oil—making a stable, emulsion-type hydraulic fluid.

The oil lubricates. The water provides all-important protection against fire.

How it was proved

Exhaustive tests of 3XF hydraulic fluid proved its effectiveness—under fire. One of those tests is pictured above.

Even when sprayed into a flame, 3XF hydraulic fluid would not create a fire hazard.

However, safety alone was not enough. 3XF hydraulic fluid also had to work in existing mining machinery. And it would be most desirable if it could be compounded *at the mine*.

Add water and use

So, Shell Research developed a special concentrate called 3XF Mine Fluid.

Add 40% drinking water to 60% concentrate—mix, and the product is ready for use.

Mines evaluated the performance of Shell fluid in hydraulically operated equipment. Twenty-five decided to use it.

On February 18, 1960, Shell 3XF Mine Fluid ushered in a new era of mine safety when it became the first fluid approved under U.S. Bureau of Mines Schedule 30.

For complete data about 3XF Mine Fluid, contact your Shell Industrial Products Representative. Or write: Shell Oil Company, 50 West 50th St., New York 20, N.Y.



A BULLETIN FROM SHELL

—where 1,997 scientists are working to provide better products for industry.

Fluid-Bed Units Dry 1x0 Coal

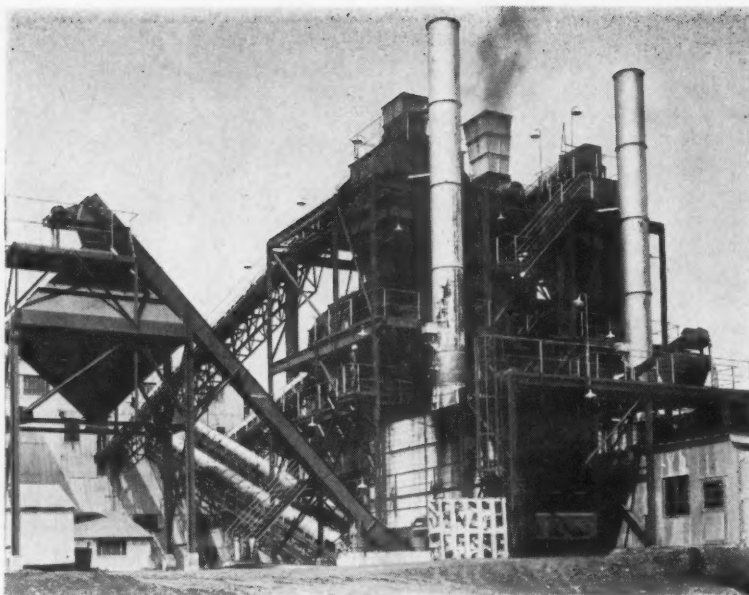
Wet-coal tonnages into Enos Coal Mining Co.'s dryers: Dryer No. 1—165 tph of 5/16-in x 10M at 10% moisture; Dryer No. 2—165 tph of 1x5/16, plus 100 tph of 3/16x0, both at 4% surface moisture

THE INSTALLATION of a pair of new Link-Belt Fluid-Flo thermal dryers results in a further boost in overall efficiency at the preparation plant of Enos Coal Mining Co., Oakland City, Ind., by providing a product that will compete in wider circles. Noting marketing opportunities that could be pursued in areas where thermally-dried coal is specified, the company undertook a study of available dryers which culminated in the selection of Fluid-Flo's and their placement in service in December, 1959.

The two 90-sq ft dryers handle 430 tph. One of them is fed 165 tph of 5/16-in x 10M at 10% moisture; the other receives 165 tph of 1x5/16 and 100 tph of 3/16x0, both at 4% moisture. These three fractions were formerly loaded as is; they are available cleaned and sized on the clean-coal conveyors in the main preparation plant.

The high moisture in the middle fraction and the finished nature of the projected feed for thermal drying complicated matters for Enos officials. Richard A. Mullins, preparation man-

DRYER NO. 1 is on the left in this photo. Functions of major units may be determined from the accompanying flow sheet. Maintenance of the drying plant is low since there are few moving parts in the dryer proper. Motors, conveyors, etc., are included in regular plant-maintenance schedules.



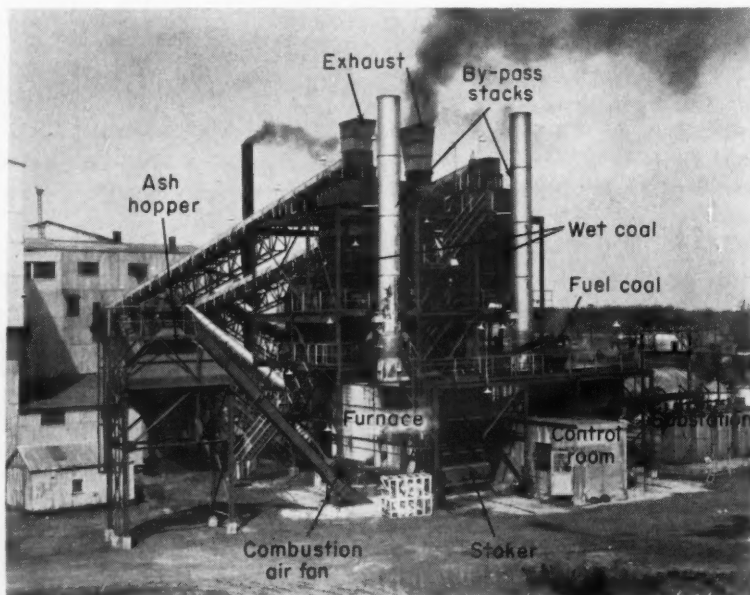
TWIN INSTALLATION of fluidized-bed dryers extends marketing range of Enos products. The two units handle 430 tph in sizes up to 1 in.

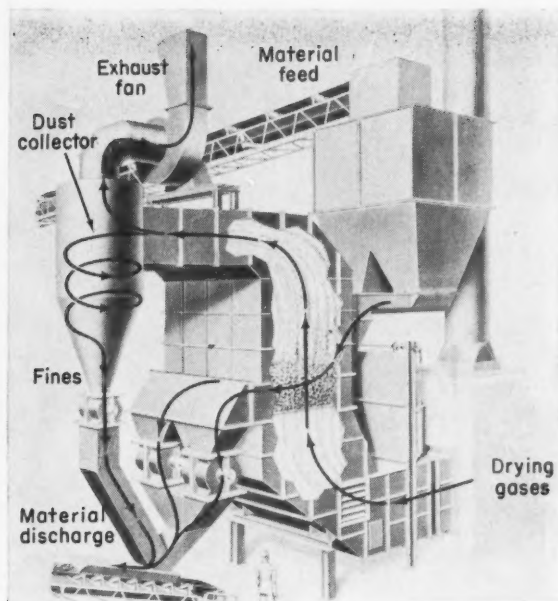
ager, points out that moisture would not drain from the clean coal as long as it was in motion in conveyors and cleaning units. Upon standing in cars for a time the coal would lose some water, but the resulting product still would not move in the target markets. Furthermore, questions arose as to whether the drying should be done in one unit, in a combination of units, or in different types of units. Space in the main plant was limited, necessitating a major project in reconstruction if dry-

ing facilities were to be included in the plant. These were some of the difficulties to be resolved.

The steps taken in their solution, Mr. Mullins says, were (1) consulting manufacturers of equipment, (2) visiting operating plants where various dryers could be observed in action and (3) settling on a solution that would reconcile all prevailing conditions at the Enos property.

In their visits to other plants Enos officials were impressed by what they





CONCEPTION OF FLOW PATTERN shows paths of drying gases, coal and fines. Screw conveyor at feed side of drying chamber and rotary valves at discharge help seal the chamber. Retention time of coal in the drying zone is controlled by automatically-adjustable throttling gate at the discharge side of the fluidized bed.

drying plant on a 6x14-ft Link-Belt vibrator. This screening step makes the third return conveyor necessary.

Dryer Design

Fluid-Flo's consist of three main sections, as follows:

1. Furnace in which fuel-coal is burned to create the drying gases. Associated with the furnace is a by-pass stack which is used during start-up, shut-down and emergency periods.

2. Drying chamber (90 sq ft) receives wet coal and drying gases, the drying gases passing up through a constriction plate onto which the wet coal is fed. The fluidized bed exists atop the constriction plate.

3. Air separator (Multiclone) removes solids from exit gases before discharging the gases to atmosphere. A Westinghouse-Sturtevant exhaust fan in the air separation section sucks the drying gases through the entire system, thus insuring that any leakage in the system will be inward movement of ambient tempering air and that there will be no loss of solids to the atmosphere.

The Enos installation consists of two of these setups in an open-air structure, as shown in the accompanying illustrations.

The furnace in each unit is a Bigelow-Liptak, rated at 75,800,000 Btu per hr combined. The hot gases are cooled to the desired operating temperature by tempering air, supplied through an automatically adjustable shutter. Hoffman stoker grates in the furnaces are of the pulsating-ash-discharge type, meaning that at 20-min intervals a 10-sec pulsation of the grate discharges ash into a furnace-bottom conveyor for elevation to a truck-loading bin.

Between the furnace stack, which serves as the by-pass stack, and the drying chamber is a guillotine gate which is opened to admit hot gases to the drying chamber. This gate is air-operated, opening or closing in about 7 sec, and it is designed on fail-safe principles to close if conditions in the drying chamber become abnormal.

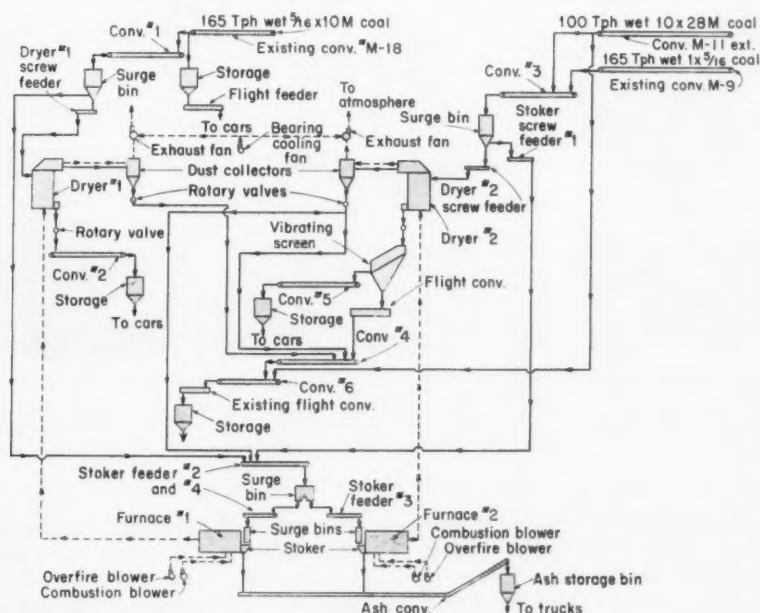
FEED for the drying operation is taken from a point above existing blending bins in main plant and dried products are returned to the same point.

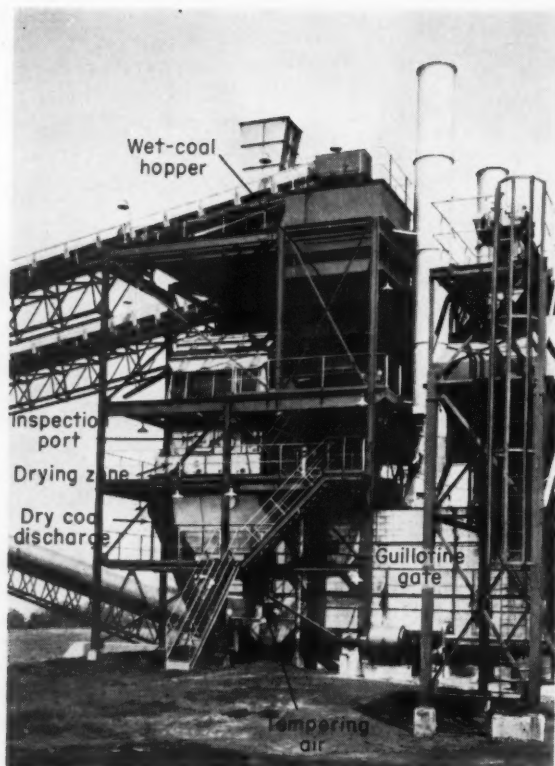
saw in the operating characteristics and performance of the fluidized-bed dryers of various kinds. This was true even though none of the plants dried coal in the coarser ranges planned by Enos.

Next question was to select a location for the drying facility that would keep plant reconstruction to a minimum. It was noted that all three sizes to be dried became available at a point above the blending bins at a plant elevation of 37 ft. This is where the clean-coal conveyors discharge into the blending bins. It was decided to

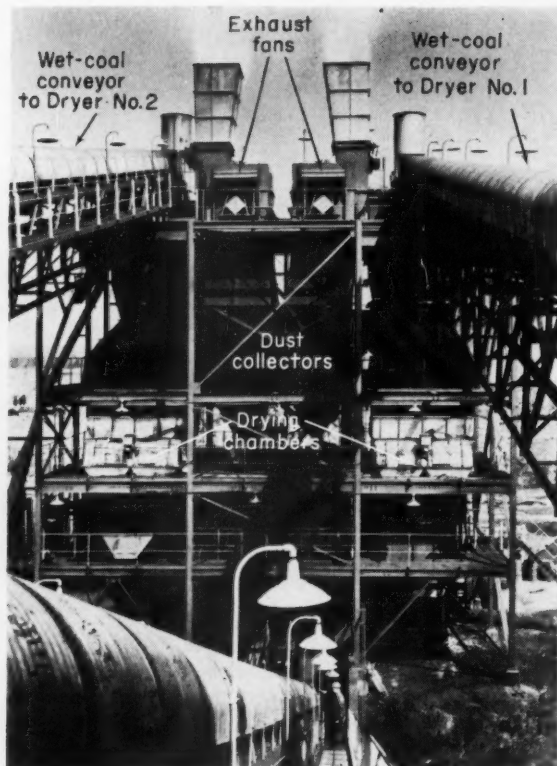
pick up the wet coal at this point and conduct it to the dryers.

The pair of Link-Belt units was chosen, as previously mentioned, and it was further decided to install them at a distance of 125 ft from the plant in a separate structure. Five new belt conveyors were installed, two to carry the wet coal to the respective driers and three to return the dried products back to the existing loading and/or blending facilities in the main plant. The 1x $\frac{1}{2}$ and $\frac{3}{4}$ x0, which together provide the charge for one of the dryers, are separated at $\frac{1}{16}$ -in in the

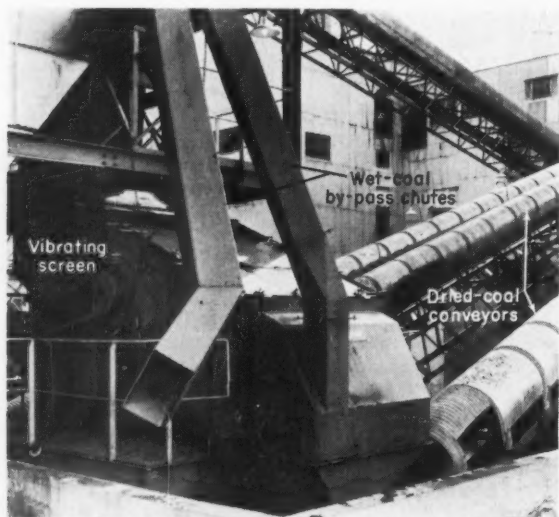




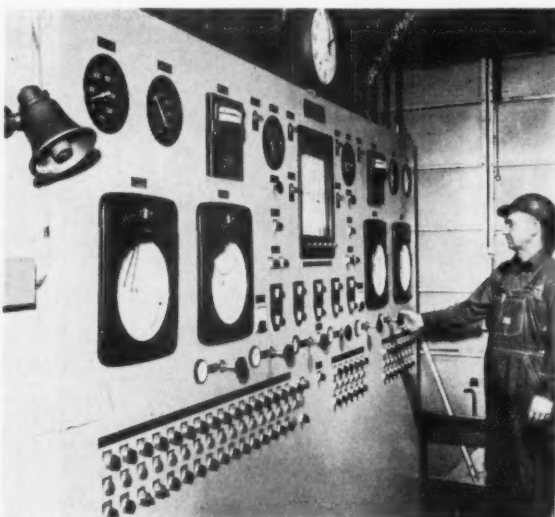
GUILLOTINE GATE, between furnace and drying chamber, is arranged to fail safe in the event of abnormal conditions in the drying zone. With the gate closed the drying gases are diverted to the bypass stack.



VIEW OF DRYING PLANT from main preparation building shows duplicate equipment. The major difference between the two is the inclusion of a vibrating screen with Dryer No. 2 to resize the thermally-dried product.



BY-PASS CHUTES guard against accidental filling of feed hoppers which are also equipped with high and low bin-level indicators and control-room alarm. Temperature of coal leaving the dryers is approximately 130 F.



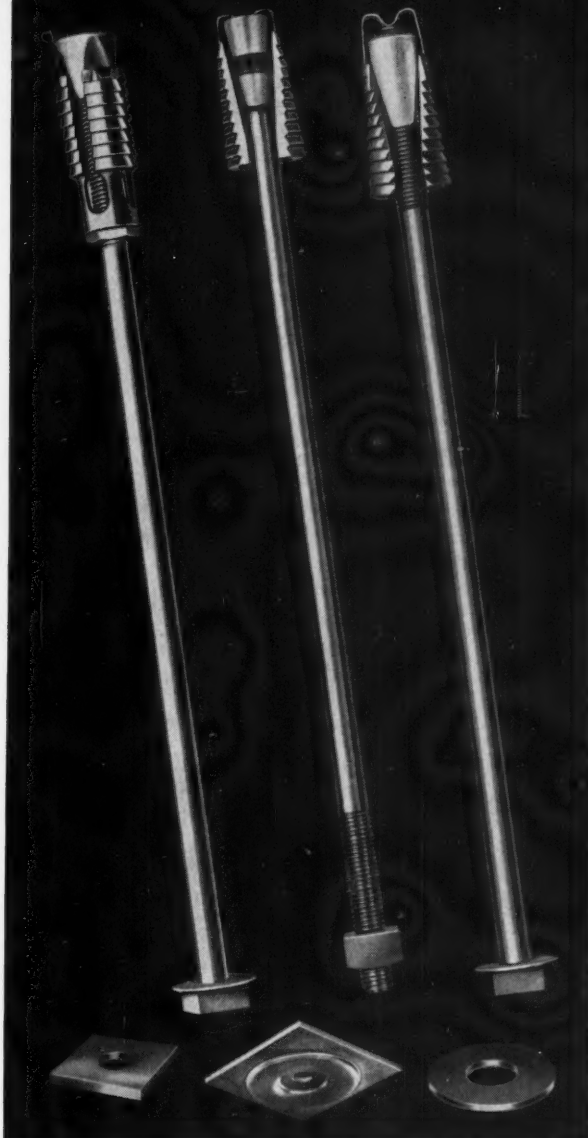
GAGES, recorders and controls are grouped in this control room under the eye of a full-time attendant. The system is designed on fail-safe principles. The drying plant has processed 600,000 tons of coal since it has been in operation.

With hot gases passing through the drying chamber feeding of wet coal is begun above the constriction plate. Upward motion of the hot gases

fluidizes the coal and move it across the drying chamber to discharge.

Feed to the drying zone is via screw conveyor from the feed hop-

per and discharge from the drying zone is through a hopper equipped with a rotary feeder to exclude air in maintaining the proper conditions in



THREE OF THE MOST WIDELY USED Republic Roof Bolts, left to right, are: square head bolt with RS-1 expansion shell, forged steel wedge head bolt with cast rigid expansion shell, square head bolt with RE-3 bail type expansion shell. Other designs are available to meet particularly unusual requirements.

SEE REPUBLIC'S NEW PLASTIC SHELL CASE

at the 1961 Coal Convention Exposition, Public Hall, Cleveland, May 15-18, Booth 739. The new shell case is standard on all Republic Bail-Type Roof Bolts at no extra cost. Simplifies handling and installation. Protects against shell damage and lost parts. Case can be left on shell when installed, making installation faster and easier.

WHICH REPUBLIC ROOF BOLT IS BEST FOR YOUR MINE CONDITIONS?

In the past fifteen years, as roof bolting really came of age, two important facts became apparent. First, no one bolt is versatile enough to meet all mine roof conditions. Second, in making a selection, a precise knowledge of the effectiveness of various bolt designs when used in different types of strata is needed.

Republic helps you solve both problems. Buy Republic and you choose from the largest selection of roof bolts available anywhere. And field trained Republic Mine Roof Bolt Engineers work with you in selecting or developing a bolt that exactly fills your requirements... *the best bolt for your mine.*

Completely Automated Production Facilities keep costs down on Republic Roof Bolts. This, combined with quality that is certified (every shipment includes a certificate stating specific physical properties of the steel used), means predictable, top performance at the lowest cost.

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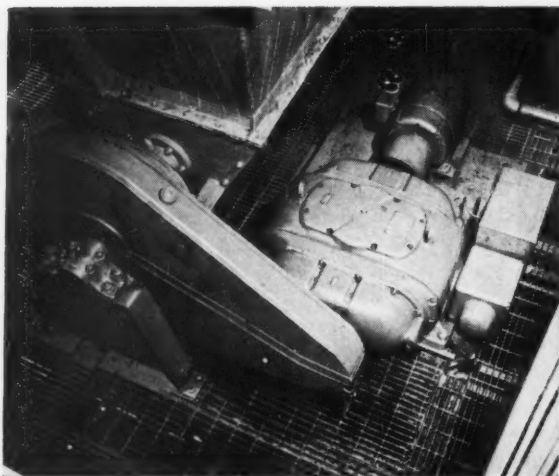
- ☐ Republic Roof Bolts
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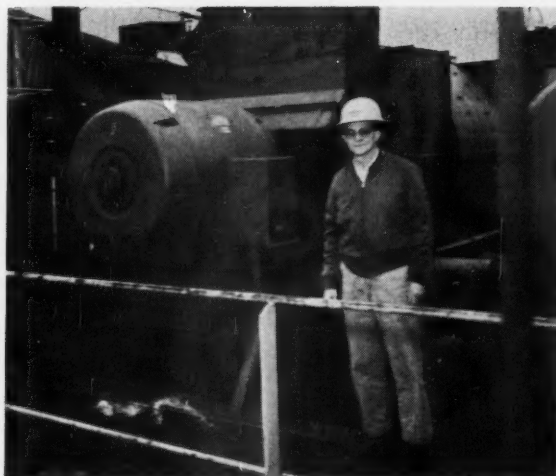
Company _____

Address _____

City _____ Zone _____ State _____



WET-COAL feeding system features automatically-controlled screw conveyors driven through this reduction and power transmission system. Gates, throttles and tempering-air shutters are operated through compressed-air cylinders. The compressor is installed at the control room.



EXHAUST FANS, which move drying gases through the system, are powered by 450-hp motors. The motors are sealed since the structure is open to the weather. Richard A. Mullins is preparation manager at Enos Coal Mining Co., which conducts operations near Oakland City, Ind.

the drying chamber. Degradation of coal has not been a problem since these feeders are the only moving parts in the drying zone and the re-

tention time of the coal in the dryer is short.

After leaving the drying zone the gases and entrained solids are

separated, the gases issuing to the atmosphere and the solids returning either to the dried-coal conveyor or to the fuel-coal hopper, as shown in the flow-sheet.

The exhaust fans at the top of the structure are driven by 450-hp Allis-Chalmers Super-Seal Silico-Flex motors. This type motor is used throughout the open structure.

Total connected load of the drying plant is 1,080 hp, plus 85 hp for the belt conveyors to and from the main plant. The drying plant, like the cleaning plant, operates one shift per day. A full-time attendant is employed at the drying plant because of its distance from the main plant. He monitors the control board, starts and stops the dryers, and generally oversees the efficient operation of the new facility.

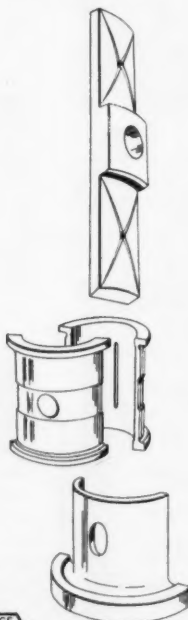
Coal-loading in the Enos pits is a two-shift operation. Coal loaded on the second shift is stored in silos having a storage capacity of 3,000 tons. Incidentally, to see how these silos increased the marketable output at Enos by 1,000 tpd read the article beginning on p 74 of the July, 1958, issue of *Coal Age*.

The Enos Coal Mining Co., and its deep-mining affiliate, Enoco Collieries, Inc., Bruceville, Ind., are headed by George E. Enos, president. Strip mining operations at Oakland City are in charge of W. J. Crawford, vice president—operations. Sales agency is Pickands Mather & Co.

for that extra long hard wear **FLOOD CITY** **#21 Bronze** **PARTS . . .**

- If wear-resistance is the problem, then Flood City #21 Bronze Parts is the answer! Flood City #21 Bronze backs up proven long life ability with accurate precision fit because Parts are expertly machined to exact specifications. And they cut downtime for replacement!
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JOHNSTOWN, PA.





A COAL FIELD FAVORITE

MARION WALKING DRAGLINES

For 18 years, Marion Walking Draglines have been providing practical solutions for coal stripping problems. They do it in a very simple way . . . by giving the operator the plus features he needs to make himself and the machine look good on the job. These include the reach necessary to stack overburden high and far away; the capacity to move big yardage consistently; the ability to work and travel on soft footing without danger of bogging down. Marion

Walkers are available in sizes from 5 to 40 cubic yards and carrying boom lengths to 280 feet. Pictured is a Marion 7400 carrying a 13-yard bucket on 175 feet of boom in a Pennsylvania stripping operation. Write for Bulletins 426, 427, 428 and 429 describing the entire line of diesel-electric and full-electric powered Marion Walkers. The Marion Power Shovel Company, Marion, Ohio . . . A Division of Universal Marion Corporation.



HORIZONTAL-THRUST LOADER with 2½-yd scoop fills trucks faster at Oakman Coal Co. Unit is loading 18-in bottom split of the Corona seam. It fills a 20-ton truck in 7 min.



SHOVEL with 3-yd dipper makes two passes in removing the lower portion of the shot bank. Width of cut is 50 to 60 ft. Overburden includes shale and sandstone.



OWNER Charles McClinton personally supervises Oakman mining activities.

Special Shovel Breaks Thin-Seam Loading Bottleneck

Unit with horizontal-thrust action scoops up 18-in seam faster, has time available for loading in second pit.

A **SPECIAL** horizontal-thrust coal loader with faster action in thin coal has broken a production bottleneck at the Oakman Coal Co., Oakman, Ala. Equipped with a 2½-yd dipper, a Koehring 205 Skooper now makes it possible for coal to be loaded faster than a bulldozer and a 3-yd shovel can uncover it.

Before the new unit went into



FASTER BULLDOZER with torque converter, planet power, and power shifting removes 60 to 70% of the overburden.



TRUCK-MOUNTED rotary dry-type overburden drill sinks 6¾-in holes at corners of 15x15-ft squares.

service a ¾-yd shovel was unable to load coal as fast as the stripping units could remove overburden. The Skooper not only keeps pace with stripping units at this pit but also will be able to serve as a loader in a second Oakman pit. Instead of buying a larger shovel for the second pit, the company plans to buy a low-boy carrier and haul the Skooper back and forth between the two pits. Thus for a comparatively low capital investment the company will be able to keep both pits operating at full capacity.

The Skooper combines the fast swing of the shovel turntable with a 7-ft independent loading action which enables it to go through numerous loading cycles while standing in one place. The unit's crowd action makes it possible for the operator to skim off the thin seam of coal without digging into the bottom rock. As a result, little or no impurity is picked up with the coal and less time is consumed picking up loose coal missed on the first pass.

Oakman's newest pit taps the 18-in bottom split of the Corona seam near Oakman. The overburden includes 3 to 4 ft of soft shale immediately above the coal, 4 to 12 ft of very hard, abrasive sandstone and 1 to 3 ft of soil.

Shortly after opening the new pit, the company discovered a thin 4-in layer of coal below the 18-in seam being mined. In the near future the company will try to recover this ad-

The Coal Age Contribution . . .

SUMMARY of discussion between Charles McClinton, owner, Oakman Coal Co., and Al Flowers, associate editor, on how *Coal Age* helped solve an operating problem for Oakman.

"I always look forward to receiving *Coal Age* because it has the latest information on mining methods and new equipment. Being a modest-sized strip operator, I don't read every page of every issue but I always look for new ideas or equipment that might be useful at my operation. The strip-mining articles get my attention, of course, but I find ideas in other parts of the magazine—Foremen's Forum, Operating Ideas, New Equipment News, and so on. For example, an item I saw in New Equipment News in *Coal Age* led me to buy my Koehring Skooper.

"We have a special problem in mining an 18-in seam here at Oakman. About 2 yr ago I noticed a writeup in *Coal Age* describing

a special Koehring loader with a horizontal-thrust action. From what I read of the machine it looked like it might be useful in loading our 18-inch seam.

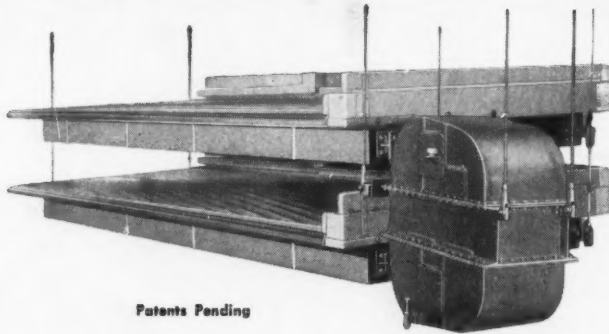
"I then called my local Koehring representative for information about the loader. It turned out that the unit was so new that he hadn't received any information on it yet and had to contact his main office for it. After I explained my loading problem to him, the Koehring representative suggested that a Skooper demonstrator be brought in.

"The Skooper loaded my 20-ton trucks in 7 to 8 min, which was about one-third as long as it took my ¾-yd shovel. I liked the loading action and decided to buy one. Since it has been in service we have learned that it can easily keep up with a bulldozer and 3-yd shovel which we use to move overburden. In fact, we plan to buy a lowboy carrier and use the Skooper in two pits."

ditional coal by stripping off the thin layer of rock with a bulldozer and then loading the coal with the Skooper. If successful, this procedure could increase coal recovery by about 22% with little extra cost for handling overburden.

Drilling and Shooting

To provide a working bench for a truck-mounted Winter-Weiss Porta-drill, a TD 25 bulldozer removes brush and levels a 50- to 60-ft-wide roadway. The drill then sinks 6¾-



Patents Pending

Employ the "77" Twin Deck Table for Dramatic Savings

Obviously, when you install a "77" Twin Deck Table, you wash twice as much coal in a given unit of floor area as you formerly did with our highly efficient single deck table.

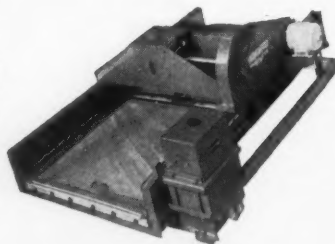
But that is only the first economy you make. Look at these additional savings:

- You can postpone new building construction until you have doubled the coal washing capacity in your present area.
- New housing, when eventually required, can be lighter, less costly, because of the reduced vibration and impact resulting from the floating suspension.
- You halve the launder runs, piping, electric power wiring and connections.
- You save power because the "77" table uses exactly the same size motor as is used on our single deck table.

For full information, send for Bulletin 77.

For Screening Economy

All New Model Leaky® screens utilize proven differential vibration, 1600 v.p.m., that snaps oversize wedging particles loose. When dust is a problem, totally enclosed models are most effective. For damp screening, Flex-Elex® electric heating of the screen jacket insures full-time open mesh. For efficient wet screening CONCENCO® spray nozzle arrangements are your answer.



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in holes at the corners of 15x15-ft squares. It usually requires three rows of blastholes to provide a 50-ft pit. One man is able to drill an average of 680 ft of blasthole in a shift.

After 40 to 50 holes are completed, a helper joins the driller and assists him in charging holes with nitrate-oil mixture. A supply crew delivers 80-lb bags of Monsanto prills to the drillholes where they are opened and oil added. Charging begins as soon as all nitrate is distributed and treated with oil.

Each hole receives 50 to 100 lb of nitrate-oil mixture which is primed with 4 ft of 150-grain detonating fuse. This section of primer fuse connects to 50-grain fuse which links all holes. When wet holes are encountered, the company uses four to six 3x26-in cartridges of Olinite D per hole to break the overburden.

Uncovering the Coal

An International TD 25 torque-converter bulldozer moves in on the shot bank and removes 60 to 70% of the overburden. Management notes that this dozer is able to move this portion of the overburden because of its planet powering that keeps both tracks pulling full time and power shifting that instantly matches power to work conditions. Thus nonproductive time is kept to a minimum.

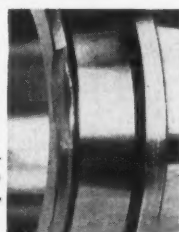
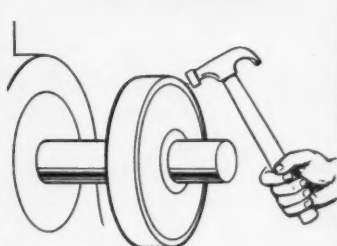
A Marion 93M diesel shovel equipped with a 3-yd Esco dipper removes the remainder of the overburden in two steps. It first works along the outcrop side of the shot material, throwing as much material as possible downhill. In removing the remaining portion of the overburden, the unit casts the material as far as possible toward the edge of the cut. Then the TD 25 dozer pushes it to the spoil area. Stripping units work two shifts.

Loading and Hauling

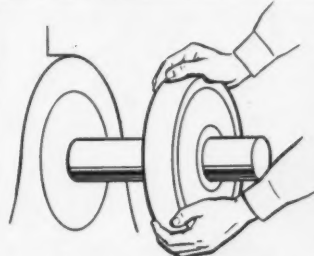
The Koehring 205 Skooper works only on the day shift at the new pit. It fills a Ford T-800 enddump truck with 20 to 24 tons of coal in 7 to 8 min. Two of the T-800 units carry coal 1½ to 2 mi to the preparation plant where it normally is crushed to 1½x0 and loaded into railroad cars. The plant also is equipped with a jig washer which is used to prepare domestic sizes.



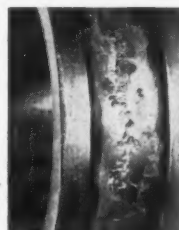
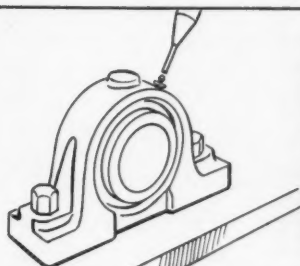
DISTRIBUTOR DAN, the **SKF** bearing man, lists **THE 5 MAIN REASONS WHY BEARINGS FAIL** and some helpful tips to eliminate them



ABUSE DURING MOUNTING. Don't hammer the outer ring of a bearing having an interference fit on the inner ring. Striking the outer ring with a hammer almost always causes denting, brinelling, and even breakage—as shown in the photo at right.



IMPROPER MOUNTING can cause edge-loading and fatigue-flaking, especially in tapered and cylindrical roller bearings. Watch out for off-square mounting or cocking of the inner or outer ring, out-of-line housings or shaft deflection—all of which mean misalignment.



INADEQUATE LUBRICATION results in breakdown of the lubricant by carbonization into a fine abrasive. Heat generated softens the bearing steel and early failure results. So, be sure to give your bearings the right amount of lubricant in the right place at the right time.



DIRT AND OTHER PARTICLES will often cause denting, as shown at right. Even soft particles—brass, aluminum, wood and paper—can dent a rolling surface. Protect your bearings by using effective seals and maintaining cleanliness at all times.



CORROSION CAN START if you wash the bearing in cold solvent and then cover it with a cold slushing compound. The moisture can't evaporate so it expends itself in corroding the steel. To prevent this, immerse the bearing in hot oil or slushing compound and allow it to assume the temperature of the bath.

Baffled by a bearing problem? Whether it's selection, mounting, or maintenance—consult your Authorized **SKF** Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.

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MOTION ENGINEERING

Advanced ball and roller bearing technology



One of the country's largest and most successful strip-mine operators, Bailey Coal Company of Morrisdale, Pa., uses Double Gray-X drag ropes on their Lima 2400 dragline.

These **DOUBLE GRAY-X** drag ropes lasted 35% longer

Here's further proof that CF&I-Wickwire's Double Gray-X lasts longer than other wire ropes on the toughest jobs.

At the Bailey Coal Company's Rolling Stone strip mine in the bituminous fields of Pennsylvania, two 190-foot Double Gray-X drag ropes were installed on a Lima 2400 dragline. Under operating conditions that subject wire rope to the most severe punishment, these drag ropes proved themselves superior to any others previously used. They didn't break up as fast near the shovel's crow's foot, where torsional stresses are the greatest . . . and they stayed on the job 35% longer than the average for high-strength ropes of well-known brands previously used.

Double Gray-X lasts longer on the toughest jobs because it's the result of an entirely new and exclusive wire-drawing technique. The use of molybdenum disulphide in this process creates a molecular shield around every wire that prevents the individual wires from grinding together as the rope operates . . . provides a smoother wire surface with greater fatigue-resistance . . . and preserves the inherent toughness of the wire during drawing.

The result is a rope that just *won't quit early*. Double Gray-X can lower your wire rope replacement and repair costs, and cut the fat off your equipment downtime costs. Ask your Wickwire distributor or CF&I sales office for complete details.

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even in
holes as
small as . . .*



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Lima Type 2400 dragline speeds stripping operations.

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Muscled for big jobs

The Lima Type 2400 is muscled for the really big mining jobs—as a variable capacity dragline, 8 cu. yd. shovel, or 110-ton crane. It is mounted on wide and long crawlers for extra ground contact and easy handling. Large-diameter drums are extra wide for increased cable capacity.

Anti-friction bearings reduce wear at all important bearing points. Large

air-operated clutches give instant response to controls. Torque converter increases output, reduces shock loading, prevents engine stall, gives cables longer life, and lowers maintenance.

Lima quality pays

These are only a few of the many quality features that pay off for you with a Lima. As hundreds of mining operators have found, Lima's extra engineering features and built-in quality mean greater tonnage and higher profit.

There is a Lima type and size for every mining operation! Shovels $\frac{3}{4}$ to 8 cu. yds., variable capacity draglines, cranes to 140 tons. Get full information today from your nearest Lima distributor on powered-for-profit Limas—or write to us.



Lima Type 1250 High Lift Shovel stripping overburden at a West Virginia mine site.

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**COAL
AGE**

Operating Guide

Lubricants and Lubricating Equipment

Lubrication Goals

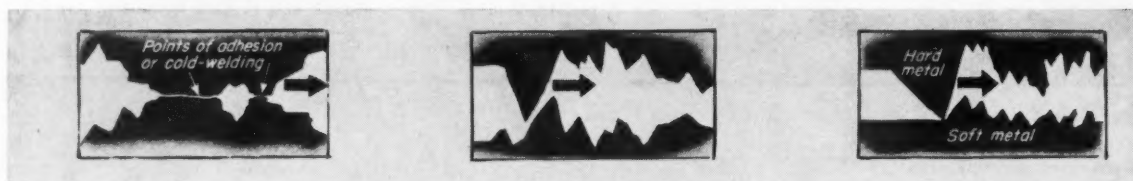
Types of Lubricants

Selection of Lubricants

Lubricating Equipment

Programming Lubrication

Moving a Dry Load



ADHESION—Load is carried on many minute surface points that are in contact. With load at rest, weight flattens these points, increasing contact area. This leads to cold-welding at these junctions. Trying to slide one surface means shearing these welded points. Force needed for this accounts for largest part of friction on dry machined surfaces.

SHEARING—For years it was believed that biggest cause of friction was intermeshing of microscopic rough spots. Adhesion was not considered serious. Simple shearing of "hills" by opposite "hills" is a definite part of the picture, especially with relatively rough surfaces. But shearing is secondary to adhesion with modern well machined surfaces.

PLOWING—Another contributor to total friction force is the digging or plowing of jagged "hills" of a hard-metal surface into a softer-metal surface. Such is case, on a microscopic scale, when a journal rides on a softer bearing metal without separating lubricant film. This factor is in a class with shearing and is also secondary to adhesion.

Lubricants and Lubricating Equipment

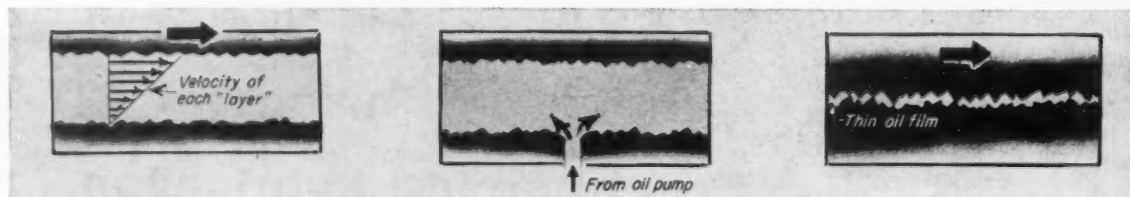
A working knowledge of the purpose, type, selection and application of lubricants and lubricating equipment is essential in this age of full-mechanical mining. The coal industry and its products literally "ride on bearings." Whether or not it does so economically depends on the effectiveness of lubrication.

MINING EQUIPMENT simply will not operate without lubrication nor will it operate economically with only partial lubrication. Equipment must be properly lubricated with the right lubricant at the correct time. The three key steps to this goal are:

1. Analyze lubrication requirements.
2. Select the right lubricants.
3. Control the use of lubricants.

These are basic in achieving an effective lubrication program. But before this can be accomplished it is necessary to know (a) why lubrication is necessary, (b) how lubricants

Separating the Surfaces

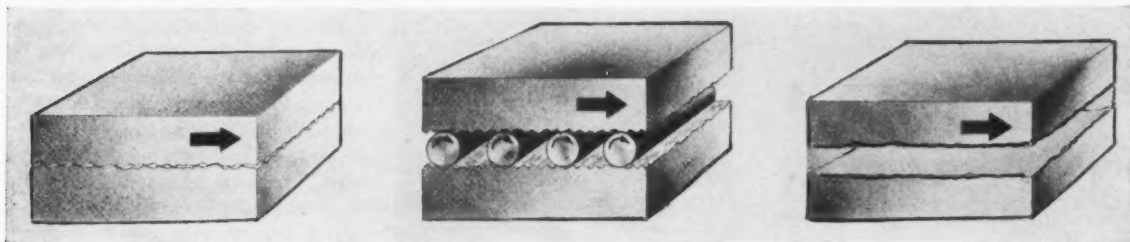


HYDRODYNAMIC—Full film of oil, exaggerated above, is normally about 0.01 to 0.001 in for 1-in bearing, or lower.

HYDROSTATIC—Oil pressure from outside pump keeps surfaces apart. For slow, heavy loads or to cut starting friction.

THIN-FILM—Many bearings operate with 0.0001 in or less of film between surfaces; some metal-to-metal contact.

Changing Friction Type



SLIDING—This is most basic type of friction—one solid body pulled or pushed across surface of another with adhesion, shearing and plowing coming directly into play. Examples are piston moving in a cylinder or shaft revolving in a bearing with no lubricant separating the surfaces.

ROLLING—Any system of rolling elements reduces friction considerably. If balls or rollers and flat surfaces were smooth and inelastic, friction would be almost zero. But materials deform, rolling elements slip under load. Starting and running friction are about the same.

FLUID—When full film of lubricant separates surfaces, only friction is from motion within the fluid. Fluid splits into "layers." Top layer sticks to top surface, bottom layer to lower surface. Each successive layer travels at lower speed, shearing the fluid layers on either side.

differ in composition and why, and (c) what factors determine application procedure.

Well organized lubrication is a most effective cost-control tool. The lubrication budget is small when compared to costs of poor lubrication, which results in excessive equipment wear and in turn increases replacement-parts cost and shortens equipment life. The loss of production due to equipment breakdowns certainly is an important cost factor, and one that depends in part on the effectiveness of the lubrication program.

Why Lubrication

If it were not for friction it would not be necessary to lubricate machinery—and neither would there be ways of stopping moving objects. Friction must be dealt with whether we want it or not. The job is to control it—reduce it when it is objectionable and increase it when it is needed. The purpose of lubrication then is to reduce friction where it is objectionable. This can be accomplished by machining surfaces properly; designing and applying bearings, gears and the like to do the best job; and using the right lubricants.

Friction

Friction is the force that resists sliding motion. It acts in a plane at right

angles to the main load. The coefficient of friction is the friction force divided by the load. Sliding friction increases with load but is independent of contact area and surface roughness for most machined surfaces. It does depend on sliding velocity, surface temperature and shear resistance of surface materials.

Moving Dry Loads—Moving loads under dry conditions, without the aid of lubricants, offer the greatest degree of resistance or friction. Adhesion, shearing and plowing are the actions that take place where these conditions exist.

Adhesion is the force that holds together the unlike molecules of substances whose surfaces are in contact. When a loaded surface rests on another surface it actually rests on the many points of the two surfaces in contact. The weight of the load flattens these points, resulting in an increase in contact area. This leads to cold-welding of the points. If the load is put in motion the welded points must be sheared, thus requiring a large force to overcome this adhesive resistance, or friction.

Shearing is the action or force causing two contacting parts or surfaces to slide upon each other when moving apart in opposite directions parallel to the plane of contact. This type of action is not as harmful as adhesion since machined surfaces are much better and more finished today than

they were a number of years ago.

Plowing is another form of shearing. This action consists of a hard-metal surface plowing into a softer metal, such as a mine-locomotive journal riding on a soft sleeve bearing. This also adds to the frictional resistance.

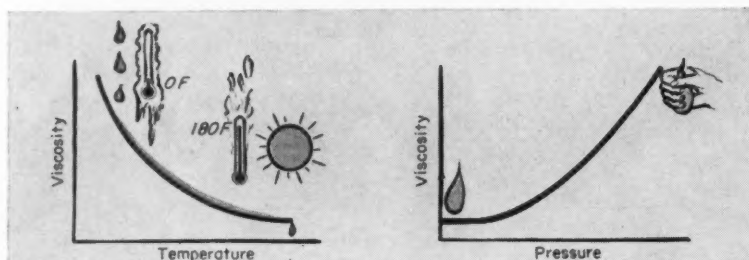
These actions take place when an object moves across the surface of another stationary object. Regardless of how precision-machined the surfaces may be, adhesion, shearing and plowing take place. Fine metal cuttings found at a sleeve bearing that has not been lubricated is one result of these forces.

Overcoming Friction—There are ways of reducing this friction. One is to place rollers between the two flat surfaces so that the load moves on rollers. If a heavy object, for example, is to be moved from one location to another, it is easier to lift it up and place rollers between the load and the floor. This is essentially what ball and roller bearings do.

Still another method of reducing friction is to apply oil between the two surfaces. Friction is reduced to the motion within the oil separating the surfaces since the two surfaces do not come in contact with each other, but are separated by the oil.

From these facts it becomes evident that to reduce friction the surfaces must be separated by a fluid or fluid-like film. This is where lubricants enter the picture. Lubrication is the

What Affects Bearing Load

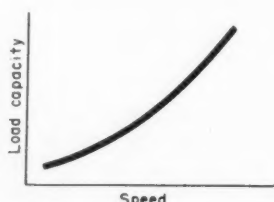


TEMPERATURE affects oil's viscosity. Thick viscous oils have greater internal friction but can support larger loads than thin oils. An ideal oil would not change viscosity with heat.

HIGH PRESSURE increases viscosity. That is why you can use a thin (low viscosity) oil in modern equipment and still have it support heavy loads. But high viscosity increases fluid friction.



VISCOSITY must be juggled to handle maximum load without overheating. Increasing viscosity allows more loading. But higher temperatures would result from increases in fluid friction.



SPEED influences heat formed in bearings; high speed means faster shearing of oil layers. But speed helps oil form cushion in bearing, so higher speeds generally allow higher loading.

principle of supporting a sliding load on a friction-reducing film.

Maintaining Oil Film—The big problem is to maintain an oil film between surfaces whether they are flat, rollers or balls. This involves hydrodynamic and hydrostatic principles—thick-film lubrication; and boundary lubrication—thin-film lubrication. Each has its limits. Hydrodynamic lubrication can be applied to nearly all types of continuous sliding actions where extreme pressures are not involved. The principle is essentially the same whether it is applied to flat surfaces, such as, thrust bearings, or cylindrical surfaces such as journal bearings.

Hydrostatic application differs in that oil pressure is supplied by a pump to keep surfaces apart. This method is used for the most part for slow, heavy loads and to reduce starting friction.

Boundary lubrication is used when it is not possible to provide the condi-

tions that make hydrodynamic lubrication possible. If shaft speed, for example, is too slow or pressure is so great that even a heavy oil will not prevent surfaces from making contact, boundary lubrication must be employed to meet lubrication requirements.

Two other conditions make boundary lubrication necessary; (1) when the oil used is heavy enough to resist shock loads but is too heavy for normal loads; (2) when stop-and-start and forward-and-reverse operations make it impossible to maintain a fluid film.

Boundary conditions can be satisfied by a number of special lubricants with properties that best meet the needs of the particular application. These necessary properties are obtained from various additives to the oil. The end result is a better load-carrying ability for the oil.

Viscosity—The most important single property of an oil is its viscosity, or

resistance to flow. Thick fluids have relatively high viscosities and do not flow readily. Thin fluids have low viscosities and flow easily.

Viscosity changes with temperature. When an oil is heated its viscosity is lowered and it will not support as heavy a load. The reaction is opposite when an oil is cooled: higher viscosity, greater load-carrying ability.

High pressure increases the viscosity of an oil. Basically this permits the use of low-viscosity oils to support heavy loads in modern equipment. One disadvantage is that high viscosity increases fluid friction.

Speed influences heat formed in bearings because it results in shearing of the oil layers at a faster rate. However, speed provides better shock-resistant properties for oil and permits heavier loading.

Viscosity ratings are meaningless unless associated with the temperatures to which they apply. The rating should make the lubricant capable of handling the loads for a given application without overheating. If viscosity, for example, was increased it would permit heavier loading, but an increase in fluid friction would cause temperature to rise.

Actually, viscosity determines, at least in part, friction loss, load-carrying capacity, heat generation, film thickness, ability to flow and wear. Selection of the correct oil viscosity for a machine is a job for the machine designer or lubrication engineer. The variables are too numerous for the inexperienced person to make an intelligent selection. The difference between the viscosity of one oil and that of another is often the difference between the success or failure of a machine.

Loads are supported by a thick film (full-fluid film) or a thin film of oil, depending on the type of bearing, gear, etc., to be lubricated. Knowing how these films are formed, and why, is necessary if the fundamentals of lubrication are to be understood.

A full-fluid film is made up of layers of oil. The layer closest to the metal—actually it is absorbed by the metal surface—is called the absorbed film. The next is the boundary film, and the middle layer or layers are the full-fluid film area. In thin-film lubrication the full-fluid film does not exist, leaving only the boundary layers. Often this consists of a single

layer covering the bearing surface by absorption or chemical reaction.

When oils containing extreme pressure additives are used for thin-film lubrication, the film is formed by chemical reaction with the metal. Full-fluid film lubrication depends on the viscosity of the oil to form the film.

Where thin-film lubrication is used and loads are not too severe, an agent known as an oiliness or film-strength additive is used. Lubricants for worm gears and pneumatic tools use this class of additives. Extreme-pressure additives are used where heavy loads are encountered.

Oiliness additives increase film strength. These additives are usually oils of animal or vegetable origin. Lubricity also refers to oiliness, and both apply to a property of an oil that is separate from viscosity. Oiliness and lubricity are effective only under the conditions of boundary or thin-film lubrication, where they reduce friction by preventing film breakdown. They have no effect with full-fluid film lubrication.

Under conditions of thick-film lubrication, the lubricant is forced between moving surfaces because of its viscosity, which resists the forces tending to separate its molecules. A thick film is formed between the surfaces. The thickness varies with load, viscosity, bearing area, speed, shape of surfaces and the position of the surfaces.

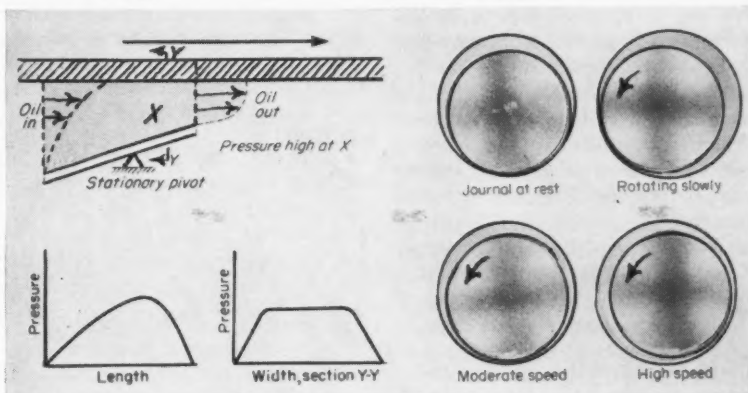
Types of Lubricants

The performance and life of bearings, gears, chains, etc., requires that a lubricating film be present at areas of contact. The absence of, or an inadequate lubricating film, will create high friction, thus causing failure.

Before a lubricant can be selected to do a specific job there are certain characteristics that should be known about it in addition to an understanding of the effects that coal dust, heat, pressure, water and acid have on it.

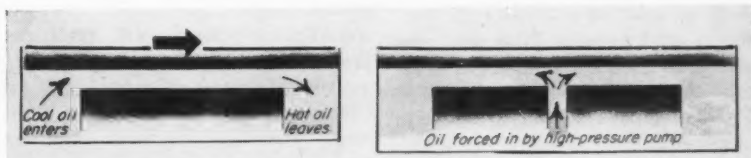
Oil vs. Grease—Although oils provide better lubricating properties, most rolling-type bearings are lubricated with grease. Both oils and greases today contain the desired properties necessary to provide low friction between sliding members: oils simply do it better.

Building Pressure in Bearing



PRESSURE is built up by moving slider dragging lube film into a converging wedge. Principle works for plain and thrust units.

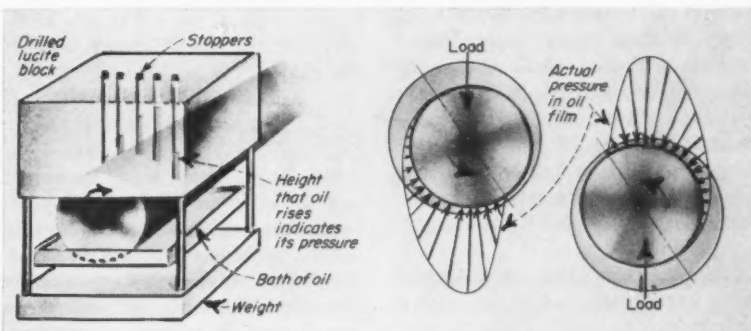
SPINNING SHAFT drags oil into a wedge-shaped layer between journal and bearing, lifting shaft.



PARALLEL surfaces induce some pressure by heat expansion rather than wedge action; heat expands oil.

MOTION of surfaces not necessary with hydrostatic system to keep them apart. Pressure lifts shaft to ease starting.

How Loading Affects Pressure



ACTUAL MODEL of a plastic bearing, sketched above, uses colored oil to show how pressure pattern builds.

LOCATION of pressure depends on where the load is applied. So do not feed oil in at top of bearing on upward loads.

Oils dissipate heat more rapidly, feed into the sliding area better, and will carry away contaminants, such as, dirt and moisture, more effectively.

If oil offers these outstanding properties, why then, is grease used almost universally? It is simply a matter

of economics. When greases are used, other advantages, such as, simpler housing designs, less maintenance, better sealing against dirt and moisture, and fewer problems with leakage, offset the advantages of oils.

Oil-lubricated bearings are not

Lubricants and Lubricating Equipment

widely used in the mining industry. They are, however, found on large fans, rotary converters, M-G sets and the like. Bearings on these units seldom fail. The general lubrication procedure for this system is based on following the specific instructions of the manufacturer or lubrication engineer. Following instructions and carrying out a lubrication program are the big reasons for the long life of these bearings. If grease-lubricated bearings were to receive the same attention, they too would last much longer than they do.

Fluid Lubricants

These lubricants are divided into three classes—mineral oils, fixed oils and synthetics. Mineral oils are extracted from crude petroleum. Fixed or organic oils are extracted from animal, vegetable or fish materials. Synthetics are man-made lubricants, consisting of chemical compounds other than hydrocarbons, or of modified hydrocarbons. They do not contain any fixed oils.

Petroleum products separated from crude petroleum, and other components of crude, require still further processing to produce machinery lubricating oils.

Lubricant manufacturers are constantly improving their products to provide industries with better lubricants for their bigger, faster, heavier and more precision-built machinery. It would be impossible to describe in detail all the products on the market today. However, from a practical standpoint, the basic lubricating oils, from which most present-day products are derived, are:

Spindle Oils—These are oils with very low viscosity, which are used to lubricate high-speed shafts in plain bearings with a minimum of clearance.

Machine Oils—For all practical purposes, oils in this group are used on machines where leakage is heavy. These oils are not very stable since they do not normally remain in the machine long enough to break down or sludge. They are relatively inexpensive, provide a high-strength film and adhere readily to metallic surfaces.

Hydraulic or Turbine Oils—These

oils are applicable where they will be used over and over for long periods. They possess stability and do not form harmful deposits or sludge. They require the same qualities as the machine oils.

Engine Oils—These oils are similar to hydraulic oils and are used to lubricate internal-combustion engines. They will withstand high temperature. Carbon formed by these oils is not abrasive when suspended in the oil. Diesel engine oils, compressor oils and the like are derived from engine oils.

Cylinder Oils—These oils provide high film strength, adhere well to metal surfaces and resist decomposition by heat. They are used to lubricate worm gears because of their high film strength. Considerable rubbing takes place where worm gears are used and a high film strength lubricant is necessary.

Gear Oils—These oils, normally, are of the engine or turbine types. They are used to lubricate spur gears.

The preceding is a list of the practical divisions of lubricating oils. From these oils and the in-between oils, lubricant companies can obtain or enhance properties desired in any particular products by using additives. Additives will be discussed later in this guide.

Fixed Oils

For the most part, fixed oils are not used to any great extent. They readily decompose by heat and tend to oxidize to gums at low temperatures. They also contain a high percentage of oxygen. Their main uses are in the manufacture of greases and as a compounding agent in mineral oils. Fixed oils have the ability to form stable emulsions with water and provide good lubricating qualities in the emulsion form.

Synthetics

Synthetic lubricants are man-made and are not derived from a natural material, such as, crude petroleum or animal and vegetable oils. They are lubricants consisting of chemical compounds other than hydrocarbons or of

hydrocarbons modified by reactions with other elements.

There are a number of synthetic lubricants in use today. Some of the more common are:

Silicone Oils—The main advantages of these lubricants over natural hydrocarbon oils are their high viscosity index, low volatility and high resistance to oxidation and hydrolysis. Thermal stability and fire resistance, generally, are good. Silicones are not compatible with most additives.

Silicate Esters—These compounds are very similar to the silicones except that they are compatible with additives; thus improvements can be made in these lubricants with additives, while they cannot be made in silicone oils.

Phosphate Esters—The most outstanding properties of these lubricants are their lubricity and high oxidation resistance. They are basically nonflammable. They are used primarily as extreme-pressure additives in petroleum and other lubricants.

Polyglycol Ether Compounds—Only a certain group of these compounds is used as lubricants. The primary advantage is that they can be used in machines designed for petroleum lubricants without design changes, other than nonmetallic materials which would be subjected to damage. These compounds are used as synthetic high-viscosity-index engine oils and hydraulic fluids. They also are used individually in low-temperature oils and greases, and in combination with other synthetics.

The preceding list of synthetics is not an all-inclusive summary of types, properties and uses. It points out the advances being made in synthetics, some important properties and uses.

Additives

Additives are substances mixed with fluid lubricants to improve the properties of the final product. Typical additives are:

Extreme-Pressure Additives—These are added to fluid lubricants to increase their ability to withstand heavy loads. They form a solid lubricant layer on bearing surfaces to protect

the surfaces if the fluid lubricant fails. Common additives are lead soaps, organic compounds of sulfur or phosphorus, and calcium.

Adhesive or Oiliness Additives—Such additives permit oil to adhere better to metallic surfaces and are used to hold the oil in bearings as long as possible.

Antioxidants—The main purpose of these additives, as the name implies, is to improve the oils resistance to oxidation. Actually, oxidation takes place but it reacts on the additive to form harmless products, rather than on the oil itself.

Antirust Additives—Antirust additives perform two jobs. They form a corrosion-resistant film over bearing surfaces and neutralize acid in oils.

Detergents—These metallic soaps, sulphonates, phenolates or alcoholates remove gum, sludge and other deposits, keeping them suspended in the oil. High-detergent motor oils are a good example.

Viscosity-Index Improvers—These substances reduce the change of viscosity with temperature, increasing the body of the oil at high temperatures but not making it heavy at low temperatures.

Antifoam Additives—Surface tensions of oils, normally, are increased when additives are used. Increased surface tension promotes foaming. To counteract this, silicones can be used to decrease the surface tension, thus reducing the tendency to foam.

Greases

Grease consists of a thickening agent in a lubricating oil. There are many types of grease, some using petroleum lubricants, other synthetics.

Soap Types—Sodium, sodium with calcium, and lithium soaps are generally used where wide-temperature-range anti-friction bearing greases are needed. Greases made with these soaps are well suited for applications where wide range of speeds are encountered, high temperatures up to 250 F and long grease life.

Soda-soap greases are used more on

anti friction bearings. These greases have mechanical stability, good rust preventive action and a wide temperature range.

Lithium-soap greases resist action of water, provide high- and low-temperature characteristics, and have good mechanical and oxidation stabilities. These greases are more expensive, but when they give added protection to bearings operating under specific conditions the increased cost is justified.

Calcium soap greases do not have good mechanical stability when used to lubricate antifriction bearings. They have good water-resistant characteristics and are less costly than other greases.

Barium, strontium and aluminum greases also are used where water resistance is an important factor.

Inorganic thickeners, such as, the clay and silica-gel types, are used as substitutes for soap types. These greases have nonmelting properties and are resistant to water. The thickeners by themselves do not provide rust prevention, but a properly compounded inorganic grease has built into it the very finest of rust prevention—achieved by a complex blend of rust-preventive additives. Properly formulated and compounded greases using inorganic thickeners will provide low bearing torque and feed adequately to sliding points.

Consistency—Greases vary in consistency from soap-thickened oil, which is fluid at room temperature, to greases which must be cut with a knife. The amount of oil added to the base determines body or consistency of grease. Greases are classified according to their consistency by the NLGI (National Lubricating Grease Institute) series. The numbers range from 0 to 6. The higher the number the harder the grease. There are no accepted classifications for greases outside the 0 to 6 range.

The No. 2 NLGI series is used more often to lubricate ball-and-roller bearings. The consistency of this grease causes little trouble with churning, slumping, leakage and feed to the working parts of the bearings.

Softer greases are used in multiple-row roller bearings while stiffer greases are used in large high-speed ball bearings or in double-sealed

or double-shielded permanently lubricated bearings.

Mechanical Stability—The ability of a grease to maintain its properties during operation is an important factor in selecting a grease. A grease may contain all the properties required for a specific application, but not the stamina. It must have both. Consistency, for example, should remain fairly constant. Churning, aerating or slumping should not be a problem under actual operation.

Lubricating Properties—A grease must maintain its lubricating properties for long periods of time. This is as important as stability. Grease loses its lubricating properties through loss of oil from the soap as a result of bleeding and evaporation.

Bleeding is caused by hydrostatic pressure, which forces the oil out of the base, and also by squeezing, which takes place when the soap structure shrinks. It is desirable to select greases which have a low initial bleeding rate and a high percentage of oil. A grease normally fails to lubricate when 50% to 60% of the oil has been lost.

Evaporation is controlled by selecting oils containing the necessary viscosity. If a grease is to be used where high temperatures are encountered, it must contain a high-viscosity oil.

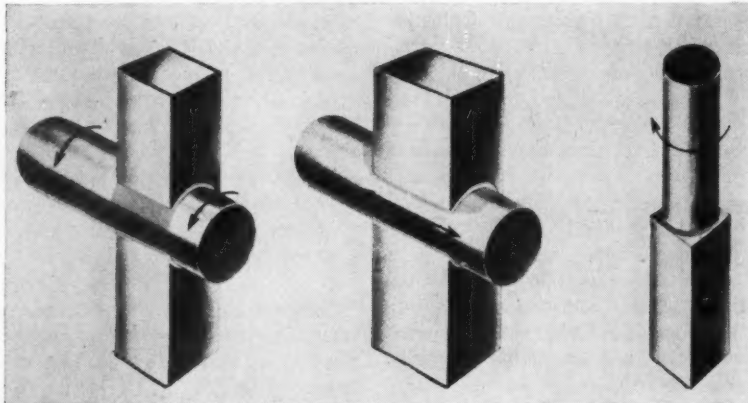
Oxidation Stability—Breakdown of grease by chemical reaction with oxygen at high temperature limits the life of grease. Oxidation produces gummy materials, which harden on cooling, and volatile products which result in loss of fluid.

Corrosion Protection—A grease must provide corrosion protection for steel bearings. Some greases, such as, sodium-soap types, give more protection than others. Water-insoluble thickeners, such as, calcium and lithium soaps, silica gel and clay types, act to prevent grease from being washed away. Rust inhibitors also can be added to greases to give them the necessary corrosion-resisting characteristics.

Synthetic Greases

Synthetics are the newest development in the field of lubrication. These

Basic Sliding Bearings



JOURNAL—Part of shaft that turns within bearing is journal. Sleeve bearing has soft metal liner on hard base. Bushings often one metal.

GUIDE—Here, bearing's job is keeping moving parts in straight line. Typical case would be crosshead assembly in steam engine.

THRUST—This type used where all or part of load parallels the shaft. Example is a rotor operating in a vertical or near vertical position.

greases are made from soaps using synthetic lubricants in place of mineral oil. Some purely synthetic greases are made with silicone.

Synthetic greases are finding more use where temperature extremes are encountered.

Silicones—Silicones have a characteristic which permits operation over a wide temperature range. They are classified according to the temperature at which they will be used. They are highly resistant to water and oxidation and are nonmelting. Synthetics usually cost more than conventional greases. The difficult lubrication problems common in the mining industry make their use most attractive. They not only minimize lubrication problems but also reduce the number of greases normally required for the many different bearing applications.

Silicone greases do not cause rubber swelling or deterioration, and can be used where rubber seals are employed.

Synthetic greases are not confined to silicones alone. Di-ester and other types find application where special lubrication problems are encountered. Di-ester grease has a wide operating-temperature range, plus good lubricating properties and rust-preventive characteristics. These greases are

used for double-sealed and double-shielded bearings, and open bearings operating at very high speeds. Price prohibits the use of di-ester grease for bearings operating under normal conditions, or where conventional grease will do the same job.

Solid Lubricants

The latest addition to the solid-lubricant family is molybdenum disulfide. Although not commonly known, it is being used on automobiles to perform a 30,000-mi lubrication job. It is a chemical combination of molybdenum and sulfur, closely resembles graphite but with twice its density. It has a unique molecular structure. Each lamina is composed of a layer of molybdenum atoms with sulfur atoms on each side. Sulfur creates a strong metal-to-sulfur bond, causing one of the layers to cling to the metal surfaces. The other side of the molecule slips easily over adjacent molecules because of a weak sulfur-to-sulfur bond. This compound maintains a low coefficient of friction at high temperatures as long as a subfilm remains. It resists oxidation. Although comparatively new to the mining industry, molybdenum disulfide probably will be used to solve difficult lubricating problems.

The more common solid lubricant is

graphite. It adheres readily to bearing surfaces, forming a layer that slides easily. It also smooths and fills in rough surfaces. Graphite films are resistant to abrasion and have good bearing strength. These films can be applied by dipping or spraying. They are not affected by weather, fuels, lubricants, water or dilute acids.

Selection of Lubricants

The job of working up bearings, selecting bearing material and, in most cases, applying them is usually in the hands of the machine designer. However, there are certain facts that should be known to get good bearing performance.

Bearings

To know the common causes of bearing failures and what to look for in the event failure does occur, will minimize future failures. These causes are:

1. Misalignment.
2. Insufficient lubrication.
3. Wrong type of lubricant.
4. Overloading and lack of cooling.
5. Insufficient clearance between bearing and shaft.

6. Poor lubricant circulation due to sharp edges, wrong grooving, etc.

Misalignment produces wear and scored shafts. When misalignment is evident the shaft will bear unevenly on the bearing, especially at the ends. Misalignment is usually caused by improper loading, bent shaft or improper installation. Once this happens a chain reaction takes place—destroying the lubricating film, overheating and wiping the bearing metal, and eventually destroying the bearing.

Plain and Sleeve Bearings—Plain or sleeve bearings must be properly aligned with respect to the shaft to permit proper lubrication.

Insufficient lubrication is self-evident. Poor lubrication is one of the biggest causes of bearing failures. Good lubrication is of course highly desirable. To merely add grease or oil is not the whole story. Equipment can be over-lubricated as well as under-lubricated. The trick or skill in lubricating is to lubricate properly with the right lubricant at the correct

time. It is a science and must be treated as such.

Lubricants, normally, are selected according to their ability to maintain an adequate film which will support the load at predetermined temperatures. This ability is influenced by the stability of the lubricant, and the thickness and strength of the film.

Overloading, usually, will not occur if viscosity is maintained within temperature limits. Cooling must be incorporated to control temperature. The method used is determined by the machine designer but auxiliary cooling may be necessary at times.

Lubricants for plain sleeve bearings are selected on their viscosity rating. Viscosity is chosen with respect to temperature, speed and load conditions, keeping in mind the environment in which the bearings will operate.

Antifriction Bearings—There is more to selecting the right grease or oil for antifriction bearings than meets the eye. A study must be made of the bearings to be lubricated and the conditions under which they operate. Once this is done, it is necessary to make a survey of the various greases or oils to insure that the one selected will provide the necessary protection for the bearing and also permit it to give satisfactory performance.

Greases and oils are made to satisfy the many operating conditions of bearings. Selection must always give due weight to consistency, viscosity, thickener used, and limits of mechanical and oxidation stability.

One thing to bear in mind is that while a grease or oil has been proved satisfactory for certain bearing application in laboratory tests, it is not necessarily true that it will do the same job in the field. Followup is essential after a new lubricant has been applied.

Oil-lubricated bearings are not often used in the mining industry. For this reason discussion will be devoted primarily to grease-lubricated bearings.

General-Purpose Greases—General-purpose greases of the NLGI Series 2 consistency normally are used for most bearings. These greases usually are the soap type. The primary factor in selecting a grease is to make sure that it does the job—cost is secondary.

Ten Types of Rolling-Contact Bearings

CHARACTERISTICS



SINGLE-ROW DEEP-GROOVE BALL BEARING

Sustains radial load and substantial thrust, either way, even at high speeds. This ability results from intimate contact between balls, deep groove. Careful alignment essential



DOUBLE-ROW BALL BEARING

Grooves positioned so load lines through balls have outwardly converging contact angle. Has lower axial displacement than single-row, substantial thrust capacity in either direction, high radial capacity because of two rows of balls



ANGULAR-CONTACT BALL BEARING

Supports heavy thrust in one direction, sometimes combined with moderate radial load. When sides are flush ground, can be mounted in tandem for constant thrust one way; in pairs face-to-face or back-to-back for combined loads



SELF-ALIGNING BALL BEARING

Adjusts misalignment from errors in mounting or shaft deflection, without capacity loss. Exerts no bending influence on shaft, essential for extreme accuracy at high speeds. Recommended for radial loads, moderate thrust either way



BALL THRUST BEARING

For one-way thrust only. Load line through balls is parallel to shaft axis, resulting in high thrust capacity and minimum axial deflection. Flat seats on rings are preferred where load is heavy or close axial positioning of shaft is needed. Should not be used for high speeds under light loads



SPHERICAL ROLLER BEARING

Has unexcelled capacity. Inherently self-aligning. In addition to heavy radial loads, heavy thrust may be carried in either direction



NEEDLE BEARING

Carries heavy radial loads without taking up a large space radially. Since rollers cannot be flange-guided this bearing has rather high friction and operates best when load is relieved at least once per revolution



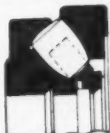
CYLINDRICAL ROLLER BEARING

High radial capacity. Provides accurate guiding of rollers, giving close approach to true rolling. Consequent low friction permits high-speed operation. Some types allow only limited free axial shaft movement. All easy to dismount



SINGLE-ROW TAPERED ROLLER BEARING

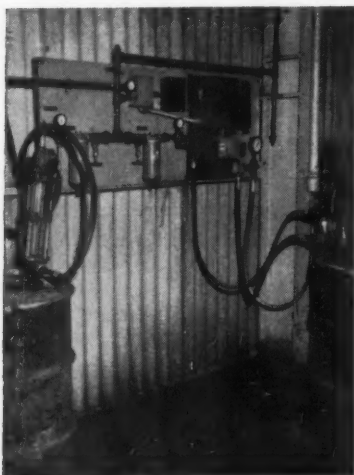
Carries heavy radial loads when opposed to another bearing taking induced thrust load. Also can carry heavy one-way thrust or combined load. Requires adjustment of internal clearance. Steep-angle type is for predominantly thrust load; multi-row types carry heavy loads in any direction



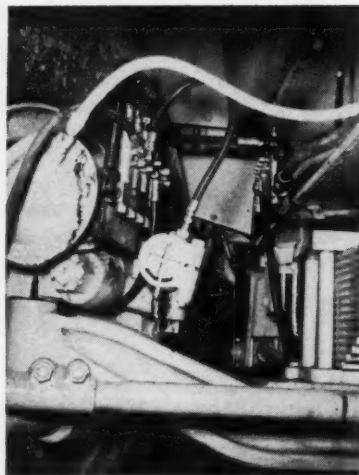
SPHERICAL ROLLER-THRUST BEARING

Compact bearing for heavy thrust loads. Especially adaptable to such applications as worm drive, where minimum bearing centers are an advantage. Self aligning and capable of sustained high speeds at low operating temperatures

Lubricants and Lubricating Equipment



CENTRALIZED PRESSURE GREASE SYSTEM reduces waste and labor, prevents contamination, promotes lubrication.



HAULAGE TRUCK with automatic lubrication. Increased equipment life, savings in labor, lubricants are main points.



PRESSURE GREASE GUNS are used in and around the mines more than any other type of lubricating equipment.

High-Speed Bearings—Greases which provide proper lubrication for bearings operating at high speed must have good channeling characteristics. Mechanical churning and feed of lubricant at high speed are of great concern. Greases for this application should not slump. If this happens in a high-speed bearing the grease will break down to a fluid and leak out, causing bearing to fail.

Sealed and Shielded Bearings—Again, the grease applied requires good channeling characteristics. If the grease does not channel quickly to provide a free path for the rolling elements, it will break down to a fluid and leave the bearing housing.

Multiple-Row Roller Bearings—Locomotive bearings require a softer grease—NLGI grade 0 or softer. This grade feeds multiple rows of rollers better, and at the same time reduces leakage.

Gears

To be able to maintain proper gear lubrication it is necessary to understand the extent to which operating conditions are related to the type of gear. Basically, there are nine types of gears, including spur, internal or annular, rack-and-pinion, bevel, spiral-bevel, helical, worm, herringbone and hypoid. These gears, in operation are subjected to pressure or load,

speed, temperature and contamination—some more than others.

Gears must be lubricated properly to ensure good performance. Lubricants serve to (1) reduce wear of gear teeth as well as adjacent moving parts affected by gear action, (2) maintain gear strength and capacity, (3) minimize vibration and shock between teeth and (4) reduce noise.

The oil selected must have the right viscosity and load-carrying capacity. Lubricant selection hinges on gear type, operating conditions and ability to maintain a protective film.

Although gear lubrication has changed to some extent since extreme pressure gear lubricants have been developed, the basic requirements remain:

1. Provide sufficient stickiness to cling to the gear teeth under centrifugal force.
2. Remain a heavy-bodied-type lubricant under high temperature, but not too heavy under low temperatures.
3. Contain lubricating properties regardless of operating conditions.

Chains

Some lubrication engineers have recommended that some drive chains used in the mines not be lubricated, especially where the lubricant tends to pick up large quantities of coal dust. However, there are many chains that do need lubrication.

Lubricant selection is based on the

type of service; type of enclosure, if any; and whether it is to be recirculated.

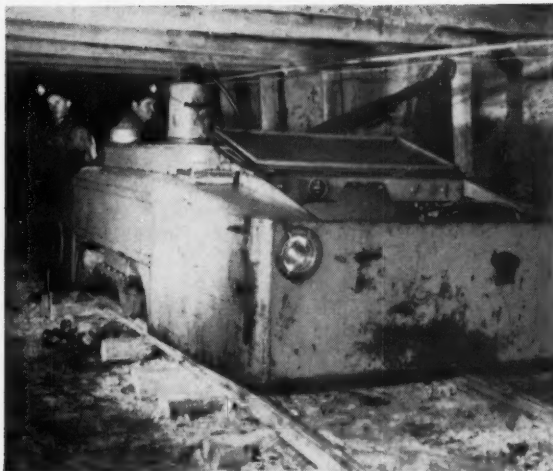
Speed, load, clearances and bending must be considered when chain lubricants are selected. The greater the speed of a chain the greater the frequency of shock on each link. The amount of shock will depend on load and service. Unlike most lubricated parts, chains, normally, are better lubricated by the capillary action of a lighter-viscosity oil rather than heavier-viscosity. The heavier oils cannot enter between the bushing clearance or link mechanisms.

Wire Rope

Components of a wire rope are lubricated during the winding process. The fiber core is treated with wool fat, petrolatum or pine tar, etc. Each wire is lubricated as it is made into strands. The strands in turn are lubricated in the final step.

Preassembly lubrication is done not only to lubricate but also to preserve the core structure. Petroleum-base compounds are used for this purpose. Wire-rope lubricants are:

1. Resistant to dripping at high temperatures.
2. Adhesive and cohesive.
3. Resistant to water.
4. Resistant to adherence of dust or dirt.



UNDERGROUND LUBRICATION TRUCK, trackmounted, is equipped with two tanks for oils and a third for hydraulic fluid. Air compressor is used for dispensing the lubricants.



LUBRICATION TRUCK for strip pits is equipped with a gas-powered compressor, lubricating pumps, lubricating hoses on reels, and fuel drums with the necessary hoses.

5. Able to provide maximum lubricating ability.

The fact that wire rope is lubricated during the winding process indicates strongly that it should be lubricated while in service. If it was considered a piece of equipment—and it is—more attention would be given to it from the standpoint of lubrication. Lubrication is vital to wire-rope performance and life.

Flexible Couplings

Flexible couplings are used to correct misalignment of the shafts of driven and driving machines. Several types are used, each having advantages for its particular application.

Some use grease to lubricate while others use oil; in some cases either can be used. A few of the more common coupling types are:

Gear Type—The lubricant can be either oil or grease. The lubricant is sealed within the coupling. Inside parts are lubricated by the pumping action of the lubricant initiated by centrifugal force and capillary action.

A heavy motor oil or medium to heavy gear oil usually is recommended. If grease is used it is of a sodium-base type which resists separation by centrifugal force.

Steel Grid or Spring Type—These couplings are designed for grease only. The coupling is completely filled with grease to eliminate air pockets. A heavy-duty sodium-base grease or



PROPER STORAGE AND HANDLING of lubricants will prevent contamination and waste and facilitate the handling of lubricants.

a multipurpose lithium-base grease is recommended.

Flexible Chain Types—These couplings are grease-lubricated with an NLGI No. 1 grade grease of the high quality antifriction-bearing type. The coupling is sealed to prevent leakage.

Floating-Member Type—Two types of couplings are common. One type uses a laminated phenolic floating member which does not require lubrication. The other type is metal and can be oil- or grease-lubricated. An oil of SAE 20 or 30 grade is recommended. An NLGI No. 2 grade grease can be used.

Lubricant Seals

Proper sealing is essential in reducing bearing failures. Many bearing failures are caused by foreign matter mixing with the lubricant to form an abrasive. Proper sealing will prevent this. Foreign matter also is put into the bearing housing by improper handling of the oil or grease prior to lubrication.

Like bearings, oil seals also usually are recommended by the machine designer. But these seals must be kept in perfect condition if they are to serve their purpose. Proper lubrication is useless unless seals are maintained.

Lubricants and Suppliers

*CAUTION—Applications listed are those for which the lubricants usually or frequently recommended. But in some instances other types would be better. Where there is any question or a change is contemplated, check with the lubrication engineer or supplier.

Name of Supplier	Name or Type	OILS		Special Characteristics, Additives	Application Notes*	Name or Type	GREASES		Remarks
		Viscosity Range @ 100 F	Viscosity Index				Base	NLGI Con.	
Alpha-Molykote Corp., Stamford, Conn.— "Molykote"	M55	530	57	Molybdenum disulfide	Open gears, wire rope	BR2	Lithium-molybdenum	2	Antifriction bearings
	165X			"	"	G	Molybdenum disulfide	1	Sleeve, wear-in, galling
	223X	43-1,788	81-124	"	Heavy-duty gears, etc.	Z	"	"	Powder—also spray cans as "Moly-SPRAY-Kote"
American Oil Co., New York 17, N. Y.—Amoco products.									
Ashland Oil & Refining Co., Ashland, Ky.—Ashland products. Atlantic Refining Co., Philadelphia 1, Pa.— "Atlantic"	Ebony	120-11,600	63-276			37, 38	Lime	Fluid	Antirust, mild EP (38)
	Acme	85-503	34-50			62, 81	Sodium	Semi-Fl.	
	Africo	103-1,350	33.5-95			18	Sod-lime	"	
	Champion	103-320	33.5-53			55	Lithium	"	
	Eureka	203-2,770	43-153			0, 39, 130	Lime	0	EP (130)
	Hytharm	150-1,500	44-105			63	Sodium	0	
	Ideal	150-500	44-83.5			17	Sod-lime	0	
	Premier gear	315-2,800	153-160		Antirust, oxid., foam, wear	50	Lithium	0	
	Steam cyl.	2,000-2,900	139-175		EP additives	1, 40, 131	Soda-lime	1	Antirust, ox., EP
	Diesel lub	SAE 30-40	85M		Acidless talrow	82, 18	Lithium	1	Antiox. (82)
	Ultramo	SAE 10W-40	85M		Anticorr., detergent	81	Lime	1	Antirust, ox., EP
					"	2	Lime	2	Antiox. (82)
					"	64, 19	Soda-lime	2	Antirust, ox., EP
					"	82, 54	Lithium	2	Antiox. (84)
Brooks Oil Co., Cleveland 17, Ohio	Leadolene 40, 55, 90, 110, 160-S	350, 700, 1,450, 2,300 & 3,200	54, 66, 90, 115 & 150	Loaded petr. oil—lead sulphur additives	Sleeve—40, 90, 160-S; ball & roller, gear boxes & reducers, 55, 93, 110	Thermo D, DA	Sodium	1 & 2	Ball bearings
	Leadolene 250-S, 160-S, 90, 55			Lead-seap, mineral oil	Chain drives	Leadolene	Soda-lead-aluminum	0 & 1	Roller bearings, sleeve bearings
	Leadolene 375 Light Kingrat 85, 115, Sp. X Lt.	1,003-1,800, 6,333	85, 115, 250	Min. oil, sulphur-lead	Flexible couplings Wire rope	375L, 375M, 375H			
Samuel Cabot, Inc., Boston 10, Mass. Cities Service Oil Co., New York, N. Y.	Pacemaker 2, 5, 7	200-210, 510 & 960	47-62-65, 84-58		Ball, roller, sleeve, enclosed gear drives (Z, wet air; T, turbo), chain drives	Trojan H-2, HA-2, Trojan M-2, NA-2	Lithium	2	Ball, roller and sleeve bearings
	Pacemaker				Pneumatic tools	Trojan H-EP, Trojan S, Trojan F, Trojan P, C, Trojan T	Sodium	4 & 5	
	Neptune 11Z to 16Z	162-1,135 to 95-104	95M		Open gears Worm gears		Calcium		EP—shock High temp. Tractor rollers, etc.
	Cisco, 5Z				EP gear service Wire rope (Raven for dust),				Adhesive No temp. limit Good water res.
	Optimus-Penn								
	Optimus								
	Trojan L								
	Cisco 3Z, 5Z								
	Raven 3, 7								
D-A Lubricant Co., Indianapolis, Ind.—D-A products Joseph Dixon Crucible Co., Jersey City 3, N. J.—Graphite-base lubricants									
Dow Corning Co., Midland, Mich.	Dow Corning 710			Phenylmethyloxy polysiloxane	Conv. bearings—high temp., humidity, weather	Dow Corning 44, 41	Silicone	Fluid, light, med., heavy	Bearings—30 to 400 F (44); 0-500 F (41); -100 to 350 F (33).
						33			

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Lubricants and Suppliers

OILS				GREASES				
Name or Type	Viscosity Range @ 100 F @ 210 F	Special Characteristics, Additives	Application Notes*	Name or Type	Base	NLGI Con.	Application Notes*	Remarks
Sinclair Refining Co., New York, 20, N. Y.				Litholine-Moly Permanent EP, XEP	Molybdenum- disulfide		Multipurpose	Shock, extreme loads
				Sincolube Jet Nos. 5, 8 10, 20	Calcium-load Sodium Sodium	00-2EP 0-4 -0-2	Heavy duty Bearings, couplings Exposed gears, cable	EP additives Antioxidation
Sun Oil Co., Philadelphia 3, Pa.				Onyx EP Onyx 500, H, HH, XH		MS, HS	Exposed gears Gears, chains, wire rope	HH and XH usually require heating
	55-60 to 1,200-1,300	Antioxidation & corrosion	General lubrication — bearings, gears, etc., compressors, air tools.	Prestige 740 A EP			Universal underground machine lubricant, wire rope	
Sunep oils	300-350 to 2,500-2,800	Extreme-pressure, antiox., corrosion	Gears, other heavily loaded equipment; flexible couplings (150); chain drives	741 EP 742 EP Prestige 42 Prestige 40			Flexible couplings Sieve and antifriction bearings Arm. & fan bearings 0-300F wet, moist or dry	High temp., stability water res.
Circo, Sunvis			Chain drives		Lithium			
Sunoco motor oils and automotive greases								
Texaco Rando Oils—oil-lubricated ball and roller bearings; general oil lubrication of bearings.								
Texaco Meropas, Texaco Thermatex 000, Texaco Novatex EP000—gears and speed reducers.								
Texaco Ursa Oil HD—transmissions								
Texaco Rock Drill Lubricants—pneumatic tools.								
Texaco Grater 2X Fluid—exposed gears.								
Texaco Grater A—wire rope.								
Texaco Marfak Multipurpose No. 2—grease-lubricated ball and roller bearings; flexible couplings.								
Texaco Olympian Grease—mine-car wheels, general bearing lubrication.								
Tidewater Oil Co., New York 4 N. Y.—tidewater products.								
Valvoline Oil Co. Div., Ashland Oil & Refining Co., W. Freedom, Pa.—Valvoline products.								
Warren Refining & Chemical Co., Cleveland 2, Ohio—Warren products.								
Whitmore's gear-protective compositions, heat-and-spray lubricant, Lubricants Nos. 41, 42, 43 and 44, liquid-gear compositions, walking cam and open gear composition—open gears, dipper sticks, cams.								
Whitmore's Pressure-Proof No. 6-Sub Zero (Super E. P.), O-H (Super E. P.), and Lubricants Nos. 16-HD, 20-HD, 17-HD, 18-HD, 19-HD—enclosed gear cases.								
Whitmore's air-compressor oils.								
Whitmore's wire-rope lubricant.								
Whitmore's Open-chain lubricant.								
Whitmore's Anti-Friction Nos. 5, 3, 3W, 3WW, 1, 2—roller, ball and sleeve bearings.								
Whitmore's herringbone-gear, worm-gear Nos. 2 and 23—sused reducers.								

Lubricant Contamination

The effect of contamination of oils and greases in service must be considered. The common contaminants around mines are water or moisture, coal dust and acid conditions.

Water—Water contamination may cause lubricants to emulsify and lose their lubricating ability. Unless the lubricant has rust-preventative properties rusting will occur. Most lubricants of mine use should contain a soap base which resist the action of water.

Coal Dust—Dust mixed with lubricants not only increases the body but also makes it abrasive, thus increasing friction and wear of metal parts. Care in handling lubricants and proper sealing are essential.

Acid Conditions—Acid mine water will destroy lubricants and cause them to lose their ability to lubricate. If water in the mine is acid lubricants should include acid-resistant properties.

Heat

Lubricants will thin down and leak out of bearings, gears, etc., when overheated. Loss of lubricant will result in equipment failure. Many motor failures can be traced to overheating and loss of lubricant. Lubricants with high temperature rating normally should be selected for underground mine equipment since temperatures usually run higher.

Lubricating Equipment

Automatic lubrication has advanced with the development of machinery. It is difficult, however, to adapt and maintain an automatic system on mobile underground equipment.

Automatic systems are being used successfully on stationary equipment in preparation plants and elsewhere, and on mobile equipment on the surface. Minimum manpower and positive lubrication are among the reasons for the increased use of automatic lubrication systems in coal mining. These systems dispense either grease or oil.

The term "automatic lubrication" covers a long list of methods or de-

vices, such as, waste pads; sight-feed oilers; wick-feed oilers; ring, chain or collar oilers; gravity systems; mechanical force-feed lubricators; hydrostatic lubricators; splash oilers; etc. These need not be explained simply because they have been used for many years and their name describes the method of lubrication.

More recent systems include automatic metered lubrication and centralized pressure grease systems. For practical purposes lubricating equipment can be classified into two types, i.e.: automatic hand-operated and automatic power-operated.

Automatic Metered Lubrication—Metered lubrication, although not used to any great extent in coal at present, has many possibilities on stationary equipment using oil. The basic design of such a system includes a lubricator actuated by the machine, or by hand. Oil is discharged through a main tube which feeds to branch circuits going to the parts to be lubricated. A meter is located at each point to control the amount of oil delivered.

Some of the benefits of such a system are:

1. Better bearing seals and tighter gear housings. The volume of oil is limited and pressure within the bearing or gear housing is lower than it would be with flood lubrication.
2. Elimination of oil contamination.
3. Lubrication while the machine is running.
4. Multipoint lubrication with one unit.
5. Full lubrication to hard-to-get-at bearings.

The Centralized Pressure Grease System—This system is similar to the automatic metered system, except that grease is used instead of oil. This system can be hand or air operated. Advantages are:

1. Easy to operate.
2. Less waste of lubricant.
3. Less contamination.
4. Maintenance of the proper lubricating film on bearing surfaces.

Pressure Grease Guns—These are used in and around the mines more than any other type of lubricating equipment. And they can be misused if certain precautions are not observed:

Centralized Lubricating Systems—Automatic

Farval Div., Eaton Mfg. Co., Cleveland 4, Ohio —“Dualine,” “Dualine” spray, “Farval-Tanway,” “LubriVal.”
Lincoln Engineering Co. Div., The McNeil Machine & Engineering Co., St. Louis, Mo.—“Electro-Luber,” “Multi-Luber,” “Power-Drive.”
Manzel Div., Houdaille Industries, Inc., Buffalo 10, N. Y.—“Pulsolator.”
Stewart-Warner Corp., Chicago 14, Ill.—Alemitite “Accumatic,” Types I and II; “Accumite,” “Oil-Mist,” “Thermo-Aire Oil-Mist.”
Trabon Engineering Co., Solon 39, Ohio.

Centralized Lubricating Systems—Manual

Farval Div., Eaton Mfg. Co., Cleveland 4, Ohio —“Dualine,” “Dualine” spray, “MultiVal.”
Lincoln Engineering Co. Div., The McNeil Machine & Engineering Co., St. Louis, Mo.—“Centr-O-Luber,” “Multi-Luber,” “Power-Drive.”
Stewart-Warner Corp., Chicago 14, Ill.—Alemitite “Accumatic,” Types I and II; “Accumite,” “Oil-Mist,” “Thermo-Aire Oil-Mist.”
Trabon Engineering Co., Solon 39, Ohio.

Truck-Mounted Lubrication Stations

Cypher Co., Pittsburgh 6, Pa.
Stewart-Warner Corp., Chicago 14, Ill. (also skid-mounted units).

Bucket and Other Nonmounted Manual Lubricating Units

Gray Co., Inc., Minneapolis 13, Minn.—“Graco.”
Lincoln Engineering Co. Div., The McNeil Machine & Engineering Co., St. Louis, Mo.—“Kleenseal.”
Stewart-Warner Corp., Chicago 14, Ill.—Alemitite, including the new VP dual unit—1 oz per stroke or pressure to 5,000 psi as desired.

Wheel-Mounted Manual Lubricating Units

Gibraltar Equipment & Mfg. Co., Alton, Ill.—“Friction Doctor.”
Gray Co., Inc., Minneapolis 13, Minn.—“Graco.”
Lincoln Engineering Co. Div., The McNeil Machine & Engineering Co., St. Louis, Mo.—“Kleenseal.”
Stewart-Warner Corp., Chicago 14, Ill.—Alemitite “Porta-Kit.”

Powered Lubricating Pumps and Lubricators, Loader Pumps, Transfer Pumps

Gray Co., Inc., Minneapolis 13, Minn.—“Graco.”
Lincoln Engineering Co. Div., The McNeil Machine & Engineering Co., St. Louis, Mo.—“Kleenseal.”
Stewart-Warner Corp., Chicago 14, Ill.—“Alemitite.”

1. Clean fittings before attaching gun.
2. Keep gun and associated equipment clean.
3. Know the amount of lubricant discharged at each stroke to avoid overlubrication.

Lubricating Guns

Aro Equipment Corp., Bryan, Ohio.
Joseph Dixon Crucible Co., Jersey City 3, N. J.
Gray Co., Inc., Minneapolis 13, Minn.—“Graco.”
Lincoln Engineering Co. Div., The McNeil Machine & Engineering Co., St. Louis, Mo.—“Kleenseal.”
Stewart-Warner Corp., Chicago 14, Ill.—“Alemitite.”

Lubricating Fittings

Aro Equipment Corp., Bryan, Ohio.
Gray Co., Inc., Minneapolis 13, Minn.—“Graco.”
Lincoln Engineering Div., The McNeil Machine & Engineering Co., St. Louis, Mo.—“Bullneck.”
Stewart-Warner Corp., Chicago 14, Ill.—“Alemitite.”

Lubricators, Mechanical & Force-Feed

Manzel Div., Houdaille Industries, Buffalo 10, N. Y.—“Manzel Force-Feed.”
Nathan Mfg. Div., Wegner Machinery Corp., Long Island City 10, N. Y.—Type P (1-11 feeds); Type S (single feed).

Lubricators—Gravity, Sight-Feed, Etc.

Hunt Valve Co., Salem Ohio.
Lunkenheimer Co., Cincinnati 14, Ohio.
Trico Fuse Mfg. Co., Milwaukee 12, Wis.

Lubricators, Journal-Bearing

American Brake Shoe Co., Railroad Products Div., New York 36, N. Y.
Aro Equipment Corp., Bryan, Ohio.

Lubricators, Rail

American Brake Shoe Co., Railroad Products Div., New York 36, N. Y.

Flange Lubricators, Oilers

Nathan Mfg. Div., Wegner Machinery Corp., Long Island City 6, N. Y.—Type MS.
Transall, Inc., Birmingham 4, Ala.

Hose—Oil, Grease, Lubricating

Aeroquip Corp., Jackson, Mich.
Boston Woven Hose & Rubber Co., Div. American Biltrite Rubber Co., Boston 3, Mass.
Continental Rubber Works, Erie 6, Pa.
Gates Rubber Co., Denver 17, Colo.
Goodall Rubber Co., Trenton, N. J.
Gray Co., Inc., Minneapolis 13, Minn.
B. F. Goodrich Industrial Products Co., Akron 18, Ohio.
Goodyear Tire & Rubber Co., Akron 16, Ohio.
Hewitt-Robins Incorporated, Passaic, N. J.
Lincoln Engineering Div., The McNeil Machine & Engineering Co., St. Louis, Mo.
Raybestos Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.
Stewart-Warner Corp., Chicago 14, Ill.
Thermoid Div., H. K. Porter Co., Philadelphia 24, Pa.
Weatherhead Co., Ft. Wayne Div., Ft. Wayne, Ind.

Lubricating Trucks —Trucks are used both underground and at strip pits to mechanize the process. However, hand lubrication may be desirable for several reasons including low working height, cramped quarters, or the type of unit involved, such as, a

Lubricants and Lubricating Equipment

belt conveyor. But hand lubrication increases the chances of contamination, and may require stopping the units during the working periods, thus reducing output.

The preceding are among the reasons why a number of mines have placed responsibility for lubrication on special crews and have provided them with lubricating trucks. A typical underground truck usually is operated by a crew of two men, who visit all units in the mine or a section of the mine once a day on the off shift. Lubrication of electric motors in particular should be performed by an electrician or one trained in the proper motor procedure. If this job is left to those without special training, overlubrication may result whereas the specialist will know how much to add on a scheduled plan.

Lubricating trucks usually are equipped with tanks for two types of lubricants, with a third tank for hydraulic oil, and may be provided with hoses for blowing fittings, motors and the like as necessary, with air from the compressor used in dispensing the lubricants. Where the truck is track-mounted and offtrack equipment is employed, the offtrack equipment may be brought to the loading station once a week, for example, for thorough inspection and lubrication, with lubrication by hand at other times. The truck crew also can fill lubricant containers for hand lubrication.

Trucks for strip equipment also may include fuel-dispensing equipment. One such unit comprises, for example, a gas-powered compressor, lubricating pumps, lubricating hoses on reels, and fuel drums with the necessary hoses. Air pressure is used for dispensing fuel as well as lubricants, and the unit serves tractors, drills and other small mobile units.

Storage and Handling of Lubricants

One of the more serious problems of lubrication around the mines is storage and handling of lubricants. It is useless to attempt to keep lubricants clean in service if they are not stored and handled properly in the beginning.

Most storage and handling violations are a result of:

1. Storing lubricants outdoors.
2. Leaving containers uncovered.

3. Not providing a heated storage area.

4. Not keeping portable containers and lubricating equipment clean.

When these four violations are corrected considerable progress is made toward reducing maintenance cost and lost production time.

Programming Lubrication

The lubrication section of a maintenance organization should, of necessity, be given priority in achieving its goals. Anything short of this will only increase maintenance costs in other areas, and as a result decrease production.

Lubrication is a science—one that all can understand—and to achieve an effective lubrication program it must be approached and carried out in a scientific manner. A planned lubrication program offers a multitude of benefits. It is absolutely essential these days that all production equipment operate on a full-production schedule—not down because of poor lubrication.

An efficient lubrication program can be established by taking three basic steps:

1. Analyze or reanalyze the lubrication requirements of each and every component of a machine.
2. Select the right lubricants even if it means adding more lubricants to the number presently used.
3. Control the use of lubricants.

These three steps must be done and done well if lubrication is to perform its intended functions, even if it means hiring a lubricant specialist full time or on a periodic consulting basis.

The preceding steps are basic and require additional steps, all of which requires a little know-how and plenty of hard work and determination. The following are essential.

1. Ask your oil supplier to help you analyze your problems. He can be of great assistance in recommending the right lubricants; why, when and how much to apply; and in training the men who will be doing the job. It will help if you know why lubrication is necessary; how lubricants differ in composition, and why; and

what factors determine application procedure.

2. Record and identify all equipment. List all bearings, gears, chains, etc. Note bearing and gear types, operating conditions and types of service.

3. Select the lubricants but do not let the initial choice be the last word. It may have to be changed. Try to minimize the number of lubricants used but do not overdo it at the risk of having bearings fail because the lubricant was not exactly right.

4. Prepare lubrication charts for each machine noting type of lubricant, how to apply it, how much and how often.

5. Plan schedules for men and place the responsibility squarely on their shoulders.

6. Establish a record system which will show the effectiveness of the program day-by-day so that weak points can be detected quickly. The record system also should provide information on whether or not the benefits in terms of maintenance and production costs are being achieved.

7. Provide efficient, safe and economical facilities and procedures for handling, storing and dispensing lubricants. Much can be done to improve present practices and any improvements would certainly be felt in over-all cost. Purchasing lubricants can be improved. It is more economical, for example, to buy in bulk.

8. Train lubrication men in the fundamentals and use of lubricants and lubricating equipment.

9. Keep track of new developments in lubricants and equipment.

10. Monitor the lubrication program to make sure that it is being carried out as planned.

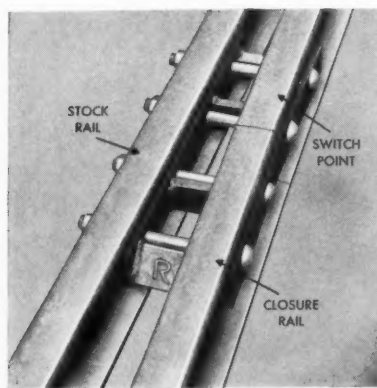
Acknowledgment—The editors are deeply grateful to the manufacturers of lubricants and lubricating equipment for much of the material in this Operating Guide. Their names with the key products they offer appear in the accompanying lists. The editors also are indebted to *Power*, a McGraw-Hill publication, for many of the illustrations.

Reprints of this Operating Guide are available and may be obtained as long as the supply lasts at a single copy price of 25¢. Write The Editor, *Coal Age*, 330 West 42nd St., New York 36, N.Y.



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EXPLOSIVES



ENERGY...

vs. Mechanical Energy

Cheaper blasting materials and improved drilling equipment have reduced the cost of explosives energy to the point where it is doing work formerly reserved for mechanical equipment. By putting more of this low-cost explosives energy to work, machinery operates more efficiently, costs are lowered all along the line.

Smart, profit-minded operators are taking a closer look at the cost of mechanical energy vs. explosives energy and they are coming up with important savings in machinery, manpower, and time—for example:

In coal stripping, explosives force is used to move up to 50% of the overburden directly on to the spoil pile. Mechanical handling costs are reduced, and coal is uncovered more rapidly.

In open pit ore mining, explosives factors are being designed to gain additional fragmentation. Much of the material by-passes the primary crusher. Production is speeded, overall costs lowered.

In quarrying and construction, operators are finding it no longer pays to blast rock just hard enough for equipment to handle it. They are taking advantage of lower drilling and blasting costs to gain more fragmentation and displacement. And in the process they are making important savings in wear on crushers, dipper teeth, wire rope, and truck bodies. They

are reducing operating costs, eliminating production delays.

The economics of drilling and blasting have changed. Looking for ways to reduce blasting costs alone is not enough. The real savings come when you look at explosives energy as a way to reduce overall operating costs.

For a closer look at some of the ways explosives energy can lower your costs all along the line, look to Atlas' full line—the only full line in the industry. Expanded plant facilities are now in production at Joplin, Missouri to assure ready availability of all products. And to give you faster, more flexible local service, new distribution facilities are being established coast to coast. Call in your Atlas Representative. His experience with the newest advances in explosives, blasting agents, and blasting techniques can help you measure the relative economy of explosives energy vs. mechanical energy in your operation.

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ATLAS EXPLOSIVES

← Using explosives energy to cast overburden to spoil pile at a large Midwest coal stripping.



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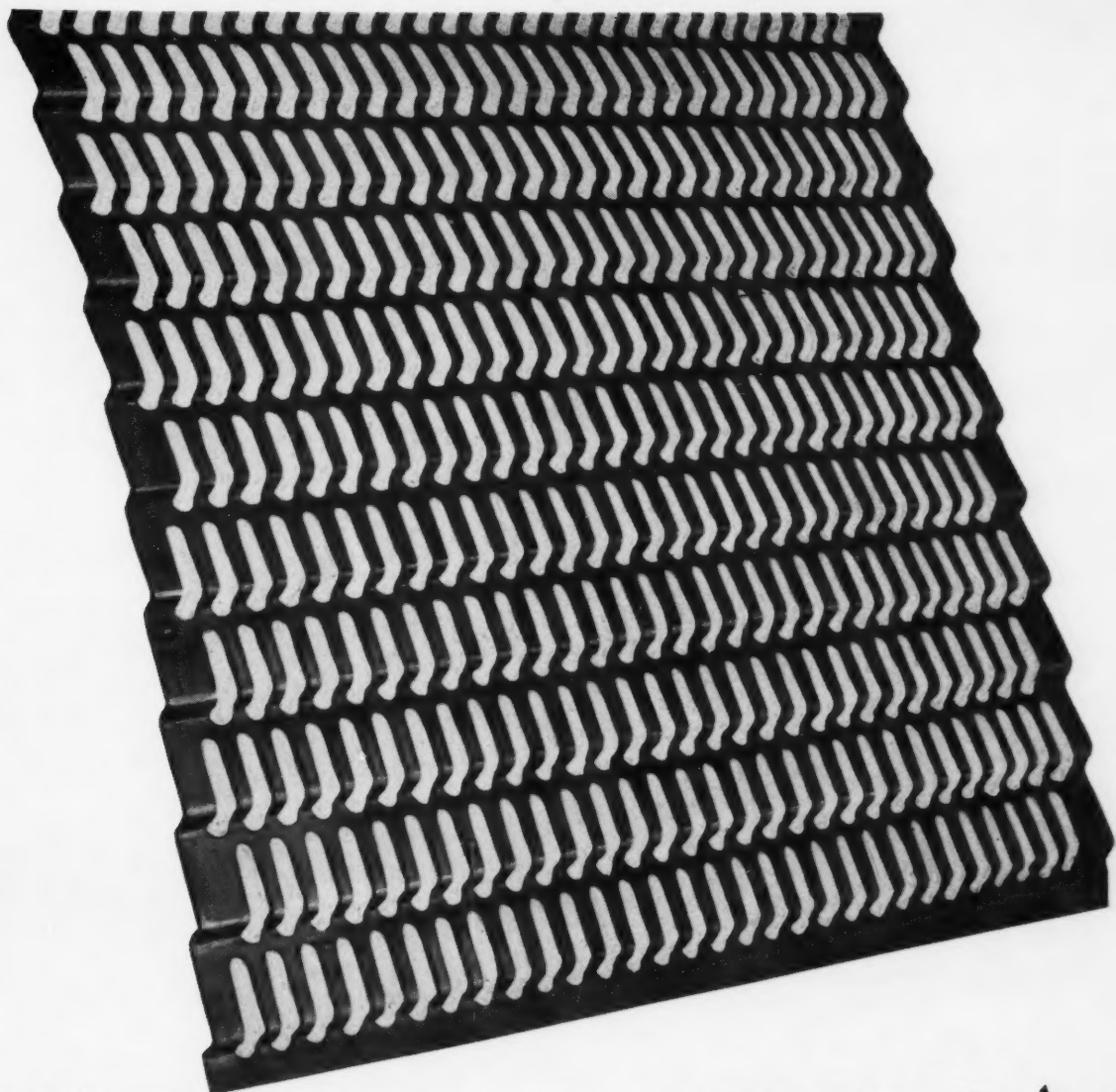
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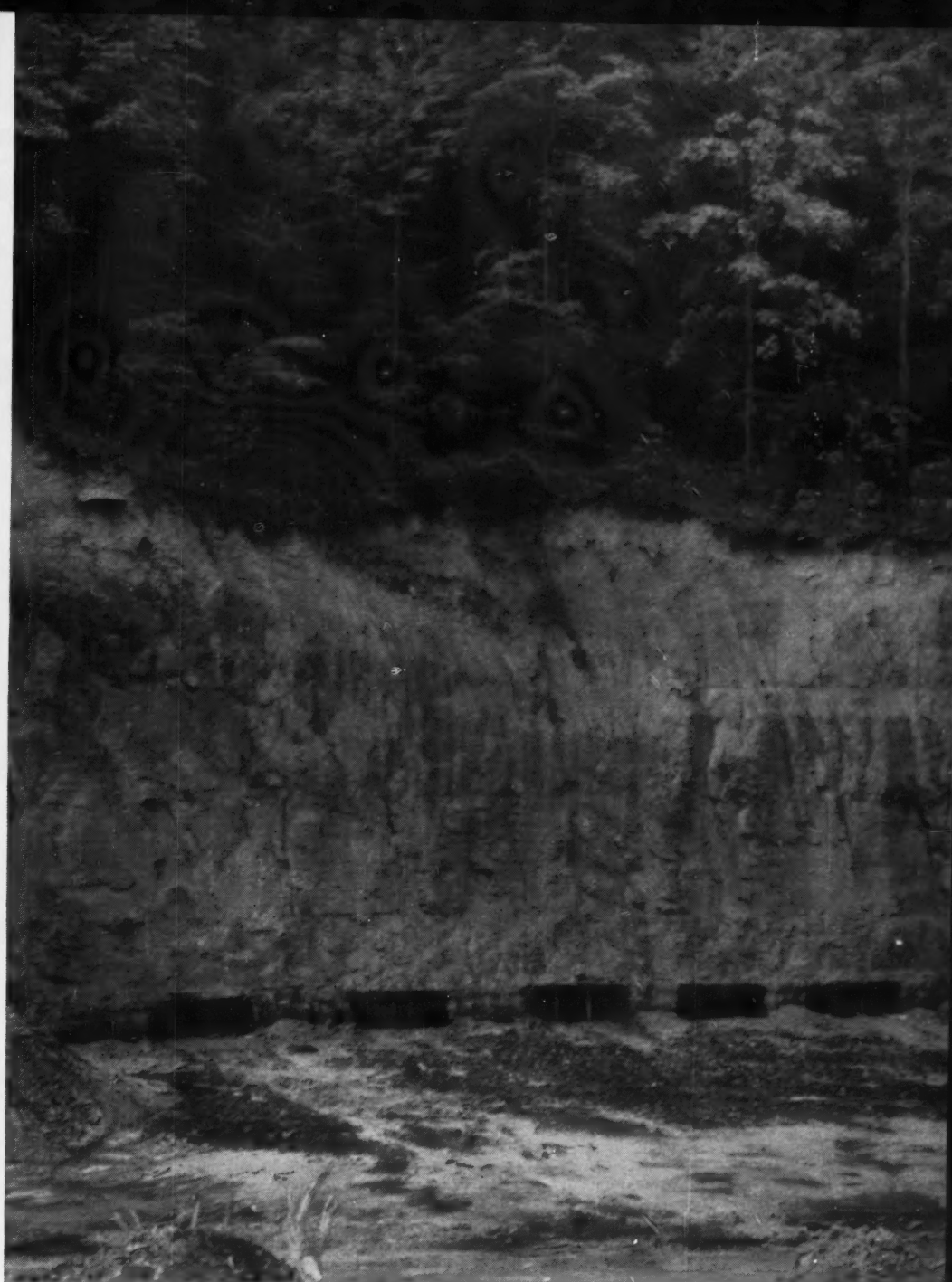
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Colmol sets fast production pace



mines the highwall

When a Jeffrey Colmol starts into the highwall you can be sure that it will handle the job of stepping up production. This machine has marked up a record of high tonnages with increased tons per man. At the same time, the Colmol cuts operating costs, making it profitable to recover "lost" coal in punch mining. This machine makes it possible to mine acreage of coal that formerly could not be mined economically. The Colmol goes in as far as 1000 feet with good cleanup and smooth bottoming. It then pulls out, moves over and punches in another 1000' hole as shown in illustration at the right. Jeffrey Colmols are designed for fast, efficient handling. They operate easily and safely on long, wide crawlers. The rugged design has been proved again and again in the toughest mining jobs. For further information write your nearest district office as listed, or write The Jeffrey Manufacturing Company, 912 North Fourth Street, Columbus 16, Ohio.

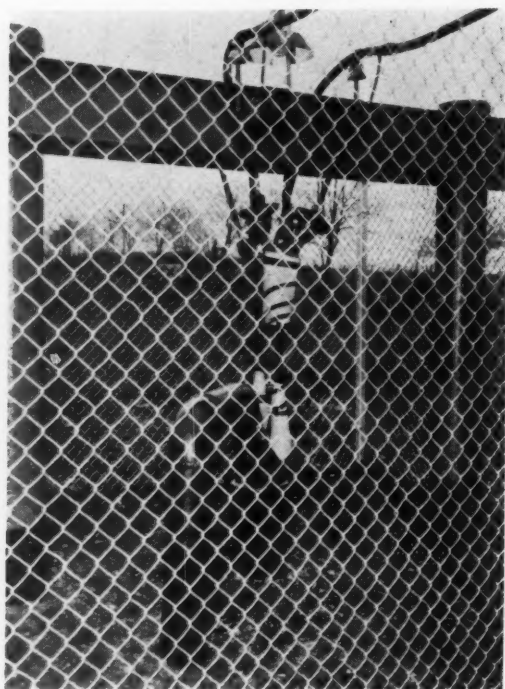
Birmingham 5, Alabama, 3012 Fourth Ave., South • Bluefield, West Virginia, 1703 Jefferson St.
 Denver 22, Colorado, Application Engineers, Inc., 2150 South Bellaire • Evansville 7, Indiana,
 1066 Diamond Avenue • Harlan, Kentucky, Martins Fork Road, P. O. Dr. 472 • Iron Mountain,
 Michigan, Service and Supply Division, Lake Shore, Inc. • Pittsburgh 22, Pennsylvania, 1424
 Oliver Building • Salt Lake City, Utah, Equipment Engineering Co., Inc., 9100 South 150 East



JEFFREY

If it's conveyed, processed or mined, it's a job for Jeffrey.

Foremen's Forum



Be Careful With That Torch!

We can profit by the experience of others. Be extremely careful in ordering the cutting or opening of borehole casings with cutting torches. The incident related below might have had deadly consequences.

AN UNUSUAL IGNITION occurred at a mine in West Virginia, says H. F. Weaver, editor, *Safety Newsletter* of the Coal Mining Section of the National Safety Council, in pointing out that this brief account may forestall a similar experience at other operations.

A borehole had been drilled from the surface to southeast mains (305 ft) and an 8-in casing had been installed. It was

to be used for ventilation and cables, and plans called for a small exhaust fan to be connected near the top of the casing.

For some reason or other, the top of the casing had been sealed and when the pipe was cut by the torch to connect the fan, gas that had accumulated in the unventilated casing ignited. The concussion extended a considerable distance from the bottom of the borehole into the

mine workings and blew out nine stoppings, but heavy rockdusting prevented propagation of the flame underground.

The lessons to be learned are (1) casings and boreholes should be well ventilated and (2) tests should be made to determine the condition of the atmosphere in the borehole before the cutting torch is used. This proves that explosions can be initiated from the surface.

How Big Is Too Big?

ONE of the major concerns of a number of our people is that certain businesses will get too big—to the point that a single company could satisfy the entire market for a certain product. Here are some facts you should remember:

Fifty years ago, the largest of the steel companies made 67% of all the steel produced in this country. Today, with four times the capacity, it produces only

about 30% of the country's steel needs.

A large oil company has in one decade increased its volume of business from about 1.25 million barrels of oil to more than 2.25 million barrels per day. However, it still accounts for the same percentage of the free world's oil production as 10 yr ago, because the whole industry has grown.

In 1911, the biggest oil company in

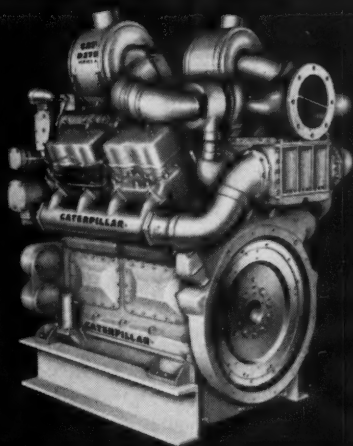
the Middle West did about 80% of the business. In the early 1950's it did less than 20% of the business in the same area. These are pictures of growth, but not of concentration.

In our coal industry, growth and development of companies into bigger producing units contributed directly to the survival of the industry and the security of the 170,000 jobs it still provides.

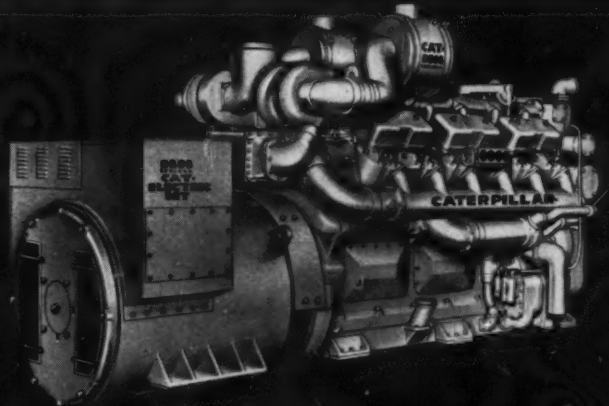
engine power

BY CATERPILLAR

new Cat D398-D379



Cat D379 Industrial Engine. The 6.25" bore, 8.00" stroke D379 and D398 both offer the latest in attachments including marine gears and generators. The D379 Electric Set develops up to 350 KW continuous, 400 KW standby.



Cat D398 Electric Set. The D398 Electric Set shown here with Static-Regulated, Static-Excited Generator features a new generator with built-in static excitation system with no exciter generator or vibrating parts. Develops 500 KW continuous, 600 KW standby.

Give more horsepower per pound, per dollar than any other industrial engine in their class

The V12 D398 and the V8 D379 are rated at 950 and 630 maximum HP, respectively. Electric set versions reach to 600 and 400 KW. Marine ratings exceed 1000 HP. These engines are now available at prices that are less than crankshaft replacement prices of some competitive engines in their class.

Published list prices show the D398 to be thousands of dollars less than the next lowest priced industrial

engine that will develop comparable horsepower. Other advantages are quality aluminum alloy bearings, aluminum pistons with cast-iron ring band for top two compression rings, drop forged-dynamically balanced crankshaft and high strength rigid block. These engines save in space and weight, too . . . with at least 35-40% less size and 4800 pounds less weight than other makes with comparable horsepower.

Here are more reasons why Cat D398 and D379 Diesels and Electric Sets give you extra value

NEW PERFORMANCE STANDARDS

- Turbocharged-Aftercooled design
- Static-Regulated, Static-Excited Cat Generators
- High flow lube and water systems
- Ability to burn wide range of fuels

NEW ENGINE FLEXIBILITY

- 100% HP from either end of engines
- Six available accessory drives — up to 50 HP each
- Controls available for either side
- Standard (counterclockwise) rotation or opposite rotation

NEW SERVICE EASE

- Fuel or lube filters serviced from either side
- Remove heads without disturbing manifolding
- Easily inspect or remove pistons, rods and bearings through large side ports
- Externally mounted oil pumps for easy inspection and maintenance

For complete specifications on the D398 and D379 Diesel Engines or Electric Sets, contact your Caterpillar Dealer or Caterpillar Engine Division, Peoria, Illinois.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Caterpillar Tractor Co., Engine Division, Peoria, Illinois, U. S. A.

The Coatsville Declaration Of Economic Freedoms

We, who are charged with responsibility for producing much of this nation's strength, hold this to be the decade of decision:

We believe the choice before the world is between slavery and freedom.

We believe the foes of freedom are formidable, but only so long as freedom is not fully understood.

We therefore dedicate this declaration to such an understanding.

We hold the core of liberty to be free choice, no less in economics than in politics; and that economic liberty has made of this nation a true arsenal of democracy—not merely with bombs and missiles, but with food for the hungry, aid for the needy and spiritual inspiration for free men the world over. It is an economic system—however imperfect—in which no man is a slave.

We see at the core of this system these Economic Freedoms:

1. Freedom of Competitive Private Enterprise, the keystone, which assures maximum production of goods and services under private ownership of the tools and facilities of production, and holds as its highest goal the opportunities for self-fulfillment for every man and woman.

2. Freedom of Choice of Occupation, which offers every person a choice of opportunity according to his interest and capacity, and makes every citizen independent in a society that is dependent on him.

3. Freedom of Voluntary Organization for Private Enterprise, which guarantees to all individuals the right to engage in and conduct the businesses of their own choosing.

4. Freedom of Contract, whereby two or more parties—buyer and seller, employer, employee, labor union—may enter into voluntary agreement—a fundamental guarantee at the core of this nation's personal and economic activities.

5. Freedom to Own Property and to pass it on to one's heirs, a major incentive toward the functioning and the generation of ownership responsibilities in a society of free enterprise.

6. Freedom to Produce, Buy or Sell in free markets at free prices without government interference—except to prevent abuses.

7. Freedom of Competition, which permits, within reasonable limits, the growth and prosperity of the individual under the American Enterprise System, and makes for higher wages, lower prices and better products.

8. Freedom to Trade, which with few limitations, sets neither boundaries nor barriers on the flow of commerce across state and nation, nor in the way of each man's pursuit of success.

9. Freedom to Make Profits, which are the rewards for economic risks

undertaken, and which support the undertaking of further risks and the further enrichment of all enterprise.

10. Freedom of Money, whereby a sound currency is dominated by economic rather than political forces, ensuring the proper functioning of a free enterprise society.

We believe these freedoms to be the essence of economic liberty, and a bulwark of political freedom.

We therefore post this declaration for all men who would be free, to see and know.

The foregoing manifesto was conceived by Lukens Steel Co., Coatsville, Pa., and was formally presented in the fall of 1960 to mark the 150th anniversary of the founding of the company. It is reprinted here from the Lukens' 1960 annual report.

The advisory committee in the development of the declaration included: Arthur Baum, business editor, *The Saturday Evening Post*; Hodding Carter, editor, *Delta Democrat-Times*; Dean Donald David, chairman, Committee for Economic Development; Dean Richard Donham, Northwestern Univ.; Osborn C. Elliot, managing editor, *Newsweek*; Clarence Francis, Lincoln Center; Ralph McGill, *Atlanta Constitution*; Prof. Olin Saxon, Yale Univ.; Merrill Watson, executive vice president, National Shoe Mfgs. Association, and Erwin D. Canham, editor, *The Christian Science Monitor*.

How Did He Know?

OF THREE PRISONERS in a certain jail, one had normal vision, the second had only one eye and the third was totally blind. All were of at least average intelligence. The jailer told the prisoners that from three white hats and two red hats he would select three and put them on the prisoners' heads. Each was prevented from seeing the color of the hat placed on his own head.

They were brought together, and the jailer offered freedom to the prisoner with normal vision if he could tell what color hat was on his head. The prisoner confessed he couldn't tell. Next the jailer offered freedom to the prisoner with only one eye if he could tell what color hat was on his head. The second prisoner confessed that he could not say for certain. The jailer did not bother

making the offer to the blind prisoner, but agreed at the prisoner's request to extend the same terms. The blind prisoner then smiled broadly and said:

"I do not need to have my sight; 'From what my friends with eyes have said

"I clearly see my hat is White!"

How did he know? If you're stumped, turn to the answer on p 60.

NO ABRASIVE DUST GOES THROUGH THIS STOPER

**LE ROI
S12VT
"DUSTLESS"
STOPER!**



Abrasive dust will never take this fast, hard-hitting stoper out of action! The exclusive Le Roi dust-collecting system enables you to get miles of trouble-free drilling footage in wet, soft, or hard formations. It protects the tool as well as the operator — lowers dust-count well below wet-drilling standards.

The S12VT draws cuttings through 5-hole CRD or Vac-Nu-Matic® bits. Dust is then passed through the hollow drill steel and out the chuck housing — *not through the stoper* — and into the dust box. The powerful suction keeps hole clean for faster, easier drilling — prevents stuck steels regardless of strata conditions.

This amazing "dustless" drill is light — it's easy to use and move. All controls are on the feed leg for convenient operation and greater operator safety.

Check all the features of the S12VT—ask your Le Roi distributor about it today! Or write to Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

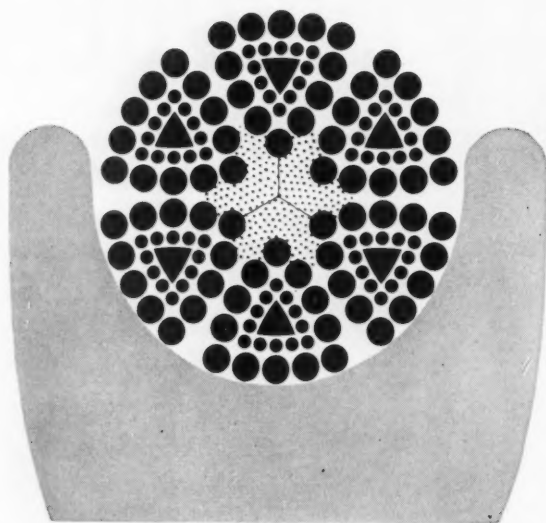
**LE ROI
NEWMATIC®
.....
AIR TOOLS**



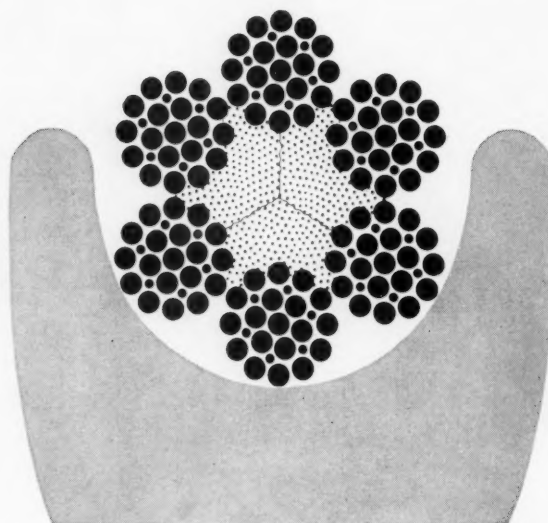
PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS
Distributed in the Coal Fields by: Acme Machinery Company, Huntington, West Virginia, and Equipment Service Company, Inc., Birmingham, Alabama.

AT-902

Get longer rope life in shaft hoists with Bethlehem Flattened Strand



BETHLEHEM FLATTENED STRAND



ORDINARY ROPE

**... it has 100 per cent more wearing surface
than rope made with round strand**

Bethlehem Flattened Strand resists abrasive wear and crushing more effectively than ordinary rope because more than half of the outer surface of the triangular-shaped strand makes contact with wearing points such as sheaves, drums, and spooled rope. Abrasive wear is distributed over a wider area of the rope surface than when a round strand rope is used. In fact, the wearing surface of Bethlehem Flattened Strand is 100 pct greater than that of ordinary rope.

Another economy feature of Bethlehem Flattened Strand: its smooth surface helps to minimize wear on drums and sheaves. It is furnished in 6 x 27 and 6 x 25 types, lang lay, Form-Set, and with either fiber core or IWRC.

For complete information get in touch with your Bethlehem wire rope distributor. Or write us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.


Export Sales: Bethlehem Steel Export Corporation

BE SURE TO VISIT US
AT THE
COAL SHOW
CLEVELAND
MAY 15-18

*There's a distributor of Bethlehem Rope near you,
supplied by our nationwide network of wire rope mill depots.*

BETHLEHEM STEEL





The Brilliant Coal Co., Birmingham, Alabama, uses a 4500 VICON shovel to reach a 26' seam of coal. Equipped with a 60' Hi-Lift boom, 45' stick and 5-yd. dipper, the machine removes up to 33 feet of overburden . . . strips an average of 3600 yds. per 8-hr. shift.

How VICON INTEGRATED CONTROLS increase clutch life by 25% or more!

On-the-job reports confirm that wherever the revolutionary Manitowoc 4500 VICON has gone to work, master mechanics say drum and swing clutch life is appreciably longer than on other excavators in the pits. A typical comment: "In the year that our Manitowoc 4500 VICON has been in operation, we've replaced only one clutch facing. In our other shovels, where clutches are *not* engaged before accelerating the engine, wear on clutch facings is at least 25% greater." The reason: INTEGRATED CONTROLS, one of several pace-setting developments incorporated into VICON design.

VICON operating levers are combination clutch controls and engine throttles. The clutches respond to a lower range of control pressures than do the throttles,

so they are always engaged before engine speed is increased. With slippage therefore kept to a minimum, there's far less wear of friction linings, far less heat. Clutches run cool, last longer.

Here are more outstanding advantages of the remarkable Manitowoc 4500 VICON. INTERLOCKED DRUMS give you higher cycle speeds and pinpoint bucket control for increased dragline production. With DUAL INDEPENDENT ENGINES, the operator can perform several functions simultaneously with full power instantly available for each . . . has a choice of speeds at his fingertips to match cycle phases to job conditions.

The 4500 VICON is offered as a 6-yd. shovel or 7-yd. dragline. See your Manitowoc distributor for complete details, or write for the fully illustrated 16-page VICON catalog (No. 33-60).

SHOVELS 1 1/4 to 6 YDS.

Manitowoc

DAGLINES 1 1/4 to 7 YDS.

MANITOWOC ENGINEERING CORP.

(A subsidiary of The Manitowoc Company, Inc.)

MANITOWOC, WISCONSIN

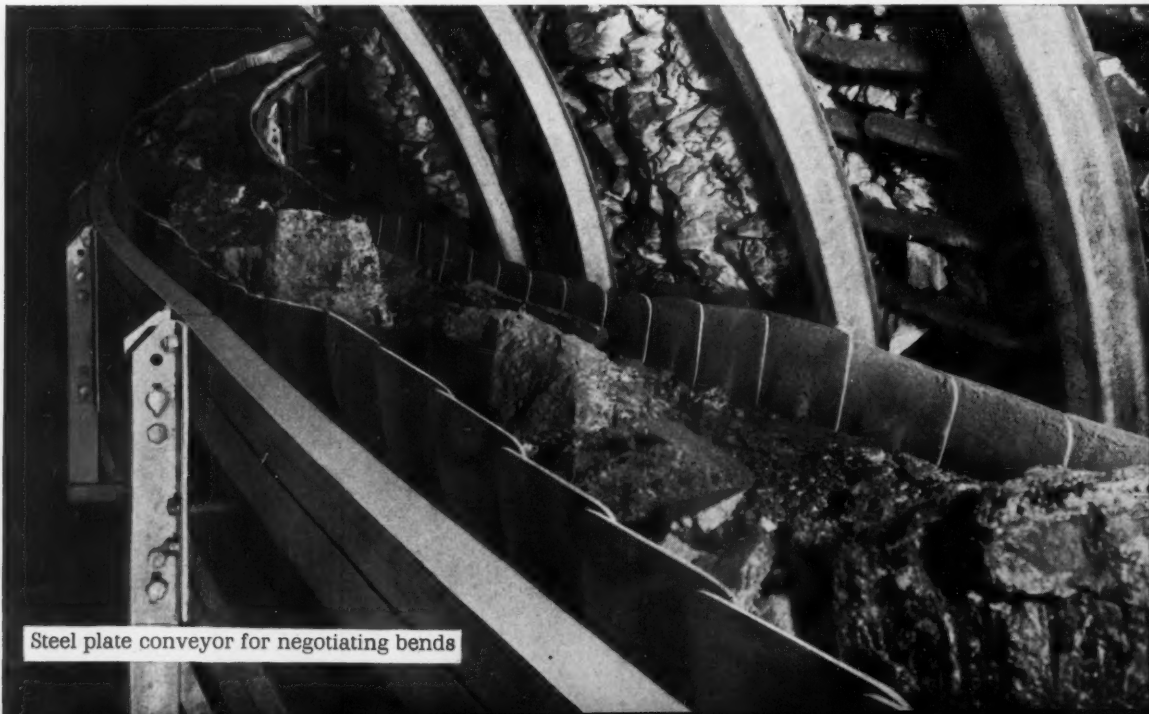


Trunk conveyor with swivel stage drive

***Eickhoff* CONVEYOR** underground and on the surface

Represented by: **STAHLUNION CORPORATION NEW YORK**

For further information please call at Cleveland Coal Show, upper lakeside halls,
Booth 1747/1846 (Rhein Stahl Wanheim GmbH.)



Steel plate conveyor for negotiating bends



Improved hydraulic operation is just one of the ways in which a Texaco "Stop Loss" Program can help you cut losses and increase production

HERE is where Texaco can help you stop profit leaks

Right at the working face, a Texaco "Stop Loss" Program can help mine management plug many important profit leaks. Let Texaco help you organize your mine lubrication, train your personnel in proper maintenance practices and — by so doing — boost your tons-per-man rate and profit, too.

The money saved by bringing maintenance practices under control is a vital management concern — because every dollar saved in maintenance costs goes directly into profits.

Texaco "Stop Loss" Program, especially adapted for underground mining, can help you save money in practically every phase of your operation. For complete information call the nearest of the more than 2,300 Texaco Distributing Plants, or write: Texaco Inc., 135 East 42nd St., New York 17, N. Y. Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

TEXACO

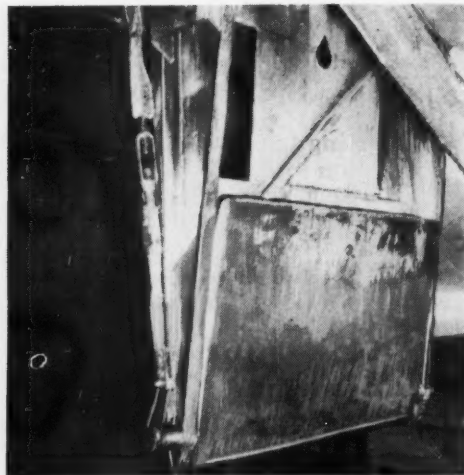
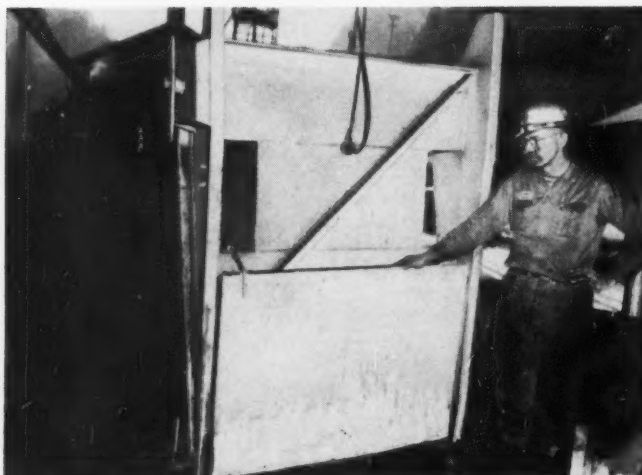


Throughout the United States

Canada • Latin America • West Africa

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

Operating Ideas



Skip-Sump Bailer Saves \$20,000 Per Year

A SAVING of \$20,000 per year and elimination of a distasteful job is the pay off resulting from installation of automatic skip-sump bailers at Island Creek's Bartley No. 1 mine, Bartley, W. Va. The money-saving sump bailer is the product of an idea contributed by Lundy Taylor, preparation plant foreman, who supervised its construction in the company shop.

Each of the two skips that deliver coal to the Bartley preparation plant has a bailer suspended from it. When a skip is in position at the loading pocket, the bailer extends down into the sump and fills with dirty water. When the skip reaches its unloading point the bailer also is in position to automatically dis-

charge into a special chute that carries the water and fine dirt away.

One side of the bailer is hinged and joined to a series of pin-connected arms. When the skip is in the discharge position the upper bailer arm strikes a dog which changes the position of the arms and causes the hinged side of the bailer to swing down and release the water into the disposal chute.

Before the bailers were put in service at Bartley No. 1 the sump had to be cleaned out once or twice every week. This job required nine men, who frequently had to be paid overtime rates. Five men were kept busy loading buckets in the sump, two men unloaded them on the surface, one man operated the hoist and one man pumped water from the sump. Mr. Taylor reports that since the bailers have been in use it has not been necessary to clean the sump by hand.



Curtains Keep Dozer Operator Warm

EVEN THOUGH the spine-chilling winter weather has left, this idea, which appeared in *Hanna Coal News*, may be worth putting in your file for next year. Robert Bernhart, shown at the controls

of his dozer, kept warm last winter by making and installing a set of curtains on his dozer. He did such a professional job that Cecil Delloma, superintendent at Hanna Coal's Georgetown No. 12 mine,

Adena, Ohio, asked him to make similar sets of curtains for other bulldozers at the Hanna Georgetown mine.

The curtains form a cockpit for the operator and not only direct some of the heat from the engine toward the operator but also keep the wind from hitting much of his body.

New M-S-A® Pager gives you the convenience and flexibility of a telephone with the amplification of a loud speaker

Now, with one versatile communications unit, you can page key personnel over a loud speaker or converse semi-privately by phone. A flip of the switch on the new M-S-A Pager lets you do either.

Uses Existing Lines

The new unit is a completely self-contained, transistorized telephone. Individually battery-powered, these units utilize existing phone lines, and can be used in conjunction with most other telephones.

Simultaneous Paging

Ten or more Pagers can be installed on a single line. This makes it quite simple

to page key men from a number of points . . . simultaneously. Once the man answers, a flip of the switch converts the Pager into a regular telephone for private or semi-private conversing.

24 Volts for Paging . . .

12 Volts for Talking

Two dry cell batteries provide the power source. And the power is expended only when the unit is in use, thus conserving battery life. Estimated battery life: 2 to 3 months on a 5% duty cycle.

Easy Installation

and Maintenance

Weighing about 25 pounds, the M-S-A

Pager can be mounted on a timber or a rib. All parts readily accessible with removal of four fastening screws which open the front half of the case. Transistors are vibration-proof . . . no filaments . . . so high efficiency, long life are assured.

For additional information, ask the MSA representative to call. And write us for helpful new product data bulletin.

Mine Safety Appliances Company, Pittsburgh 8, Pa. In Canada: Mine Safety Appliances Co. of Canada, Ltd., 500 MacPherson Ave.,
enue, Toronto 4, Ontario.

MSA



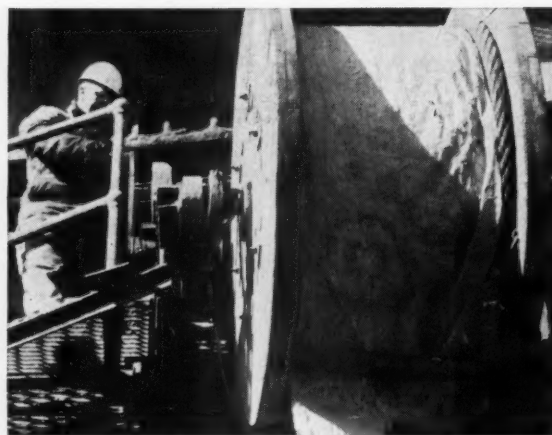
Operating Ideas (Continued)



Brake For Wire-Rope Reel

A LONG-FELT NEED for some type of braking mechanism on the big reels that store spare wire rope for the stripping shovels at Hanna Coal Co., Cadiz, Ohio, has been met with a braking device developed by Albert Doty, according to the *Hanna Coal News*.

Each reel carries 550 ft of 2½-in wire rope and is mounted



on the front of the shovel just under the boom. When stored in this position, the wire rope is ready to be put in service with a minimum of delay. When a change is necessary, the ends of the new and old ropes are welded together and threaded over the point sheaves.

Until the brakes were added to the Hanna reel racks, the reels were braked by a man holding a bar. He now stands back in a safe position from the turning reel as he regulates the brake to control the unreeling of the new wire rope.



Rebuilt Bus Carries Maintenance Men

FIELD MAINTENANCE CREWS at Hanna Coal Co., Cadiz, Ohio, now have their own transportation to the various pits where they do their work, according to *Hanna Coal News*. Instead of riding in the maintenance trucks, they ride in a rebuilt bus. The vehicle was an old school bus which was purchased some time ago in bad condition and restored to what appears to be almost original condition by members of the crew.

Safety Checks For Compressors

SAFETY in regard to air compressors can never be taken for granted, warns *The Safe Mine Foreman*, published by Eastern Gas & Fuel Associates. To keep its compressors in top operating condition, one of the company's plants set up the following inspection and maintenance schedule.

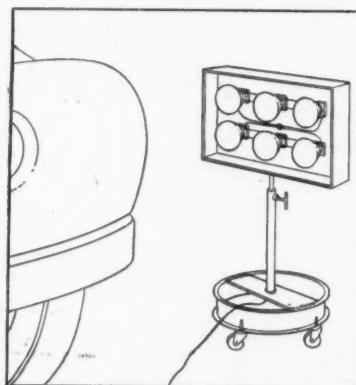
1. Inlet filters are sent to the shop weekly for exchange or cleaning.
2. Unloading valves are checked weekly.
3. The main pressure-relief valve, or the main popoff valve, is not adjusted without direct, specific orders from the chief electrician.
4. Inter-coolers or radiators are

cleaned by blowing air through them once a day.

5. Drain plugs of the receiving tanks are removed once a shift to draw off water.

Drying Stand Speeds Paint Jobs

A PORTABLE heat stand speeds work on touch-up jobs and smaller panels, reports *Fleet Owner*, another McGraw-Hill publication. To make one, mount six infrared drying lamps in a sheet metal or fiberboard box. The box need only be deep enough to protect the bulbs. Mount the lamp box on a wheeled stand made from an old rim and two telescoping pieces of pipe. A setscrew in the larger



pipe makes possible easy height adjustment. Paint the inside of the box with aluminum paint or line it with foil for more efficient reflections.



We've got an explosives expert on our staff at no extra cost...

Every Austin customer can make this statement!

Austin representatives offer more than a complete line of explosives and blasting supplies. They provide supporting technical information vital to your efficient use of these products.

Each Austin representative is qualified by education, training and experience to recommend the most effective explosive . . . most economical method of blasting . . . correct blasting supplies . . . best storage and handling facilities . . . everything needed for best results.

Also available is knowledge contained in countless case records compiled by Austin technical

representatives during the company's 128 year history. These list patterns, burden, water conditions, and the explosives recommended. By comparing latest techniques with past experience, guesswork can be virtually eliminated.

Your job may require a special mixture. Here, too, your Austin representative always proves invaluable, for he will employ services of the Austin research and manufacturing departments to develop practical solutions to your problems.


It's easy to put an explosive expert on your staff at no additional cost.

Call your Austin representative today.



AUSTIN POWDER COMPANY

Cleveland 13, Ohio



New from Gulf: a low cost, fire resistant even a torch won't ignite . . .

Gulf FR Fluid is a newly formulated water-in-oil emulsion. It's a practical answer to the mining industry's need for a low cost, fire resistant hydraulic fluid.

In this new formula, each droplet of water is coated with oil. The oil acts as a lubricant and also protects against rust. If there's a fire, the water droplets turn to steam and snuff it out.

Gulf FR Fluid has been tested and approved by the U. S. Bureau of Mines under Schedule 30 as a permissible fire resistant hydraulic fluid. (U.S.B.M. Approval 30-7)

Lastly, pump tests and field tests have thoroughly proved that Gulf FR Fluid is practical for use in hydraulic systems of underground mining equipment.



This picture, taken at the U. S. Bureau of Mines, shows that fire resistant fluid was not ignited by torch flame.

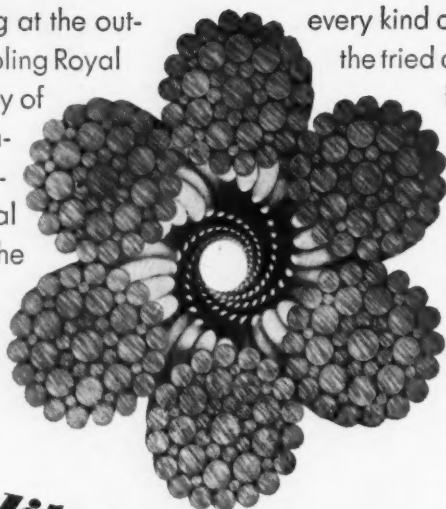
hydraulic fluid that GULF MAKES THINGS RUN BETTER!

If you want to prepare your own fluid, Gulf FR Concentrate is available. You just add water. This new fluid supplements the synthetic type of fire resistant hydraulic fluid (Pydraul*) which Gulf can also furnish. To get complete details on Gulf FR Fluid or Pydraul, call a Gulf Sales Engineer at your nearest Gulf office. *Manufactured by Monsanto Chemical Company

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas



Here are two ways of looking at the outside and *inside* quality of Roebling Royal Blue Wire Rope—the uniformity of wires and strands. Their symmetry would be relatively insignificant, however, without Royal Blue's extra high strength. It's the combination that is the source of real wire rope savings. For long, economical service on



every kind of job, there is no substitute for the tried and proven quality of Roebling Royal Blue. It pays off for you.

Learn more about Royal Blue from your wire rope distributor, or write now for free booklet to Roebling's Wire Rope Division, Trenton 2, N.J.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation.



Quality inside and outside



We put a lot of work into it—
You get a lot of work out of it



Only Spencer uses military type underwater tests to determine the relative effectiveness of commercial explosives. These tests are the latest in a continuing research program conducted by Spencer Chemical Company, the pioneer supplier of solid ammonium nitrate as an ingredient in blasting.

Precise new underwater testing method shows . . .

Spencer N-IV And Fuel Oil Produces Up To 7 Times As Much Useful Energy Per Dollar

. . . when compared with gelatin dynamites

How do you measure the true blasting effectiveness of commercial explosives? Unsatisfied with present methods, Spencer Chemical Company and a well known research organization teamed up to discover a better way.

After extensive investigation Spencer adopted underwater testing methods developed through military research. These were found to provide data better related to commercial blasting than any other testing method. As a result, more accurate standards of evaluating the actual useful output of explosives have been developed.

Latest test results show that Spencer N-IV Ammonium Nitrate and fuel oil deliver up to seven times as much useful energy per dollar as gelatin dynamites (see chart at right).

Extensive research has also shown that Spencer N-IV, when mixed with the recommended 6% fuel oil, delivers 20% to 25% more blast energy than equal charges of other solid ammonium nitrate-fuel oil mixtures. There are two main reasons for this: (1) lower density which provides greater ease of detonation, (2) special prill structure which allows fuel oil to be absorbed more evenly.

It costs you nothing to get the full benefits of Spencer's advanced knowledge and experience in this field. Just mail this coupon. No obligation of course.

PERFORMANCE COMPARISON OF BLASTING MATERIALS

Explosive	Heaving Energy Ft. Tons/Lb.	Shattering Energy Ft. Tons/Lb.	Effective Energy Ft. Tons/Lb.	Useful Energy Ft. Tons/\$
Spencer N-IV and Fuel Oil	423	60	488	14,230
40% Gelatin Dynamite	257	115	372	1,770
60% Gelatin Dynamite	384	84	468	1,800



Spencer Chemical Company
Industrial Ammonium Nitrate Sales
401 Dwight Building • Kansas City 5, Missouri
Without cost or obligation, please send me the latest information on the use of Spencer N-IV and fuel oil for blasting.

Name _____
Firm _____
Address _____
City _____ State _____

New Equipment News

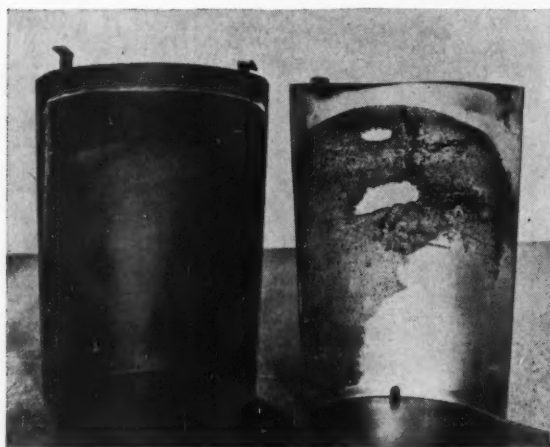
Screen With Integral Motor

This "Low-Head" vibrating screen equipped with air springs incorporates an integral mounting for reducing head room and providing ready accessibility and easy maintenance. In the new design, motor base and tubular cross member become an integral part of the horizontal screen's frame.

A number of advantages this arrangement provides, according to company engineers, includes elimination of an overhead structure, reduced head room, increased belt life due to close fixed centers between motor and mechanism, shorter belts which overcome whipping wear and elimination of making time- and cost-consuming motor alignments in the field.



"Super-Seal" motors are recommended for this type of screen mounting by the manufacturer, Allis-Chalmers Mfg. Co., 986 S. 70th St., Milwaukee 1, Wis.



Chute Lining Material

A fabric-backed urethane, "Armstrong PO-663," has been designed for use as a liner for handling coal, ore slurries and other abrasive materials by Armstrong Cork Co.'s Industrial Div., Lancaster, Pa. The new material is reported to provide maximum abrasion resistance, reduce cost by protecting expensive chutes, etc., allow use of thinner-gage materials and can be easily installed by cementing or bolting.

Photo shows two sections of grain loading chutes used the same length of time. Unlined steel chute on right was worn clear through while section lined with PO-663 shows only slight amount of surface abrasion.

Offered in standard stock sheet sizes from 12x20 in to 96x40 in in 1/16-, 1/8- and 1/4-in gages; special sizes and gages available on request.

Flexible Bus Bar

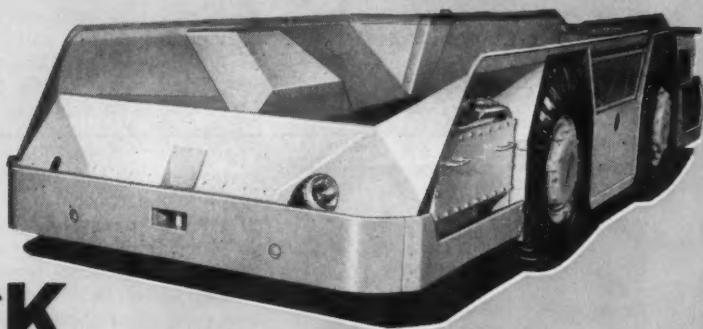
Lack of rhythmic response to vibrator action, said to be principal reason cable conductors in an electric heating hook-up on vibrating screens deteriorate, has been overcome in Dura-Flex design flexible bus bar, according to Screen Heating Transformers, Inc., 428 Erie St. S., Massillon, Ohio. Bus bar is installed to respond to vibrator motion with spring action and this response keeps the same rate as other springs in the vibrator eliminating backlash or snap which hardens metal microstructure. Adding no dead weight to the screen, Dura-Flex bus bar has no effect on the finely-balanced vibrator assembly. Flexible bus conductors may be installed on any deck without heavy outrigging extending beyond screen frame to assure a level and equalized screening surface. This bus bar provides the large cross section necessary to conduct low-voltage current but minimizes weight.

Portable Screw-Type Air Compressor

Believed to be the first of its kind manufactured in the U. S. is a portable screw-type air compressor by Gardner Denver Co., Quincy, Ill. The "Rota-Screw" is replacing the firm's present production of vane-type portable compressors. A time-proved principle forms the basis for the new compressors. Air entering the intake port is drawn into the space between lobes of two revolving, helical rotors which force the air into succeeding smaller interlobal spaces, compressing the air in a single stage until full compression is reached. As air is expelled, the next groove comes into line with the outlet port to assure smooth free-flowing air without pulsation. Features include operation at extremes of temperature, no wearing parts, operating pressure of 100 psi at 1,800 rpm and fail-safe electrical system. Full details from the company.

Mr. Mine Operator:

If your shuttle car
maintenance costs exceed
3.78 cents per ton...



BETTER PICK *TOR*KAR

There's a real challenge in this TorKar figure — *less than 4¢ per ton* for all maintenance costs including repair parts, labor, cable, tires! • TorKars have hauled millions of tons of coal at 3.78¢ *and less* per ton. The facts are available for your review. If your own shuttle car costs are higher, don't you agree that you'd better investigate . . . better buy TorKar . . . build better profits in the times ahead?

• *Let's talk TorKars, at your convenience.*

**National Mine
Service Company**



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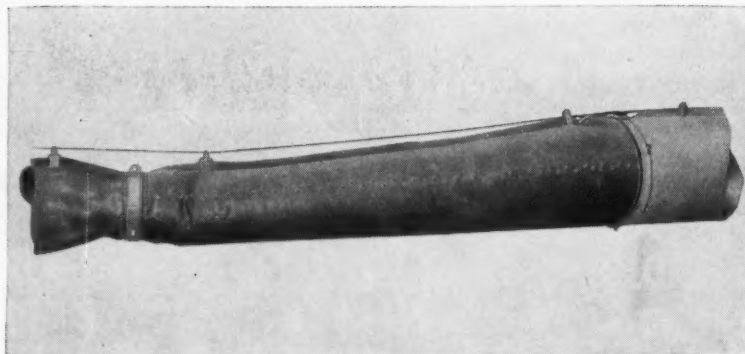
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Ashland, Ky.

CLARKSON DIVISION
Nashville, Ill.

Air Diffuser Tube

A new device called the "Diffuser Tube," designed for insertion in a blower tubing line, has been developed by American Brattice Cloth Corp., 200 King's Hwy., Warsaw, Ind.

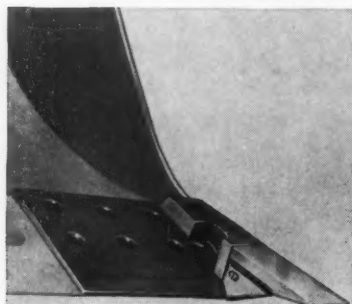
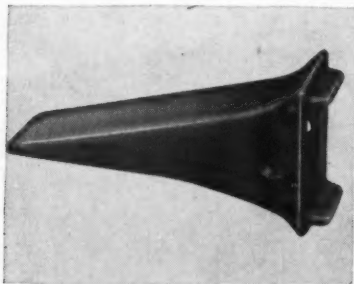
Constructed of neoprene-coated fabrics, the diffuser is offered in two types. A cylindrical type has been designed for insertion in a tubing line at a point in the entry where miners need additional ventilation. In this manner air can be bled at any point along the line where it is needed. A reducer type is available for use near the working face to supply fresh air to machine operators or men working behind the outlet end of the tubing line. This type provides a venturi action which increases velocity of



the air at the discharge end of the tubing. Also, the reducing type can be used to step down tubing diameter in areas where headroom is limited.

The diffuser is coupled to the blower

tubing line using standard couplings. Orifices for emission of air can be provided on one or both sides of the diffuser. Orifices extend the full length of the diffuser.



Ripper Tooth and Dozer Blade

Two new products have been introduced by H&L Tooth Co., 1540 S. Greenwood Ave., Montebello, Calif., to increase bulldozer production.

An all-forged nickel-alloy steel point (above) for ripping rock and other hard compact material is specially heat-treated to give maximum hardness from core depth throughout the forged alloy steel. This heat treatment plus the wedge-like shape and H&L's patented Flexpin (point-to-ripper shank) connection are reported to be responsible for its capac-

ity to withstand high impact and resist wear of abrasive materials.

The H&L corner bit (below) with sharp replaceable flexpin-type point, is said to increase dozer penetration and simplify maintenance. Forged high-alloy steel point pilots ahead of dozer blade, allows deep penetration in hardest material, maintains accuracy in cuts, eliminates side draft and greatly increases bulldozer production, according to H&L.

Motor with Variable Speed Drive

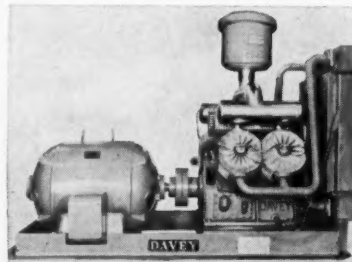
Exceptional compactness is said to result by incorporating a motor with a mechanical variable-speed drive manufactured by Cleveland Worm & Gear Div., Eaton Mfg. Co., 3300 E. 80th St., Cleveland 4, Ohio. Utilizing an integral "pancake" style motor, the new Motorized Speed Variator requires only slightly more space than an equally-rated conventional motor. Offered in sizes from $\frac{1}{2}$ to 15 hp, motors are AC-radial air-gap design and conform to NEMA design "B" specifications. Insuring precise speed setting and repeatability, the new design provides variable output speeds with 9:1 and 6:1 ranges.

Rectifier-Type Charger

A silicon rectifier-type charger that can charge up to 10 electric material-handling truck batteries simultaneously—first of this multicircuit type in a com-

pact, integrated design—is said to save up to 50% in floor space and require less maintenance than conventional horizontal motor-generator equipment. Each Exide Multi-Circuit ETR (electric truck rectifier) contains two completely automatic, tapering-current charging units and control panels within a single cabinet. Each unit is designed for easy interconnection with other such units, thus making it possible to expand a charger installation almost unlimitedly. A major advantage is that any one of the charging units can be shut down individually for repairs by means of individual AC disconnect switches, without interrupting service of the other units.

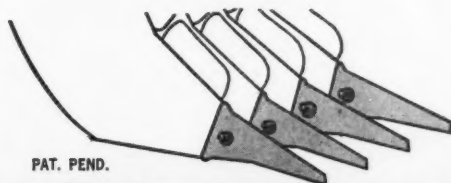
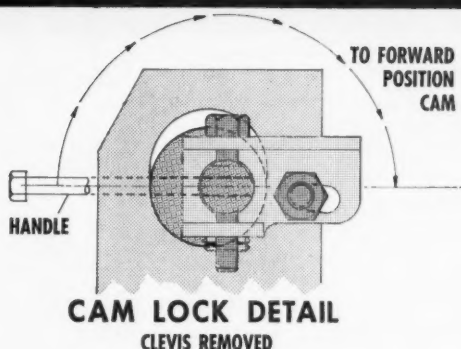
Offered by Exide Industrial Marketing Div., Electric Storage Battery Co., Rising Sun and Adams Aves., Philadelphia 20, Pa.



Reciprocating Air Compressors

A new line of reciprocating air compressors consists of both single- and two-stage units, ranging from $7\frac{1}{2}$ - to 150-hp ratings, with both direct-connected and V-belt driven machines available. Single-stage compressors are suitable for

H&L *Teeth that really dig!* **New CAM ASSEMBLY** ADJUSTS POINT TO MOST EFFECTIVE RIPPING ANGLE



Now make the precise adjustments that are necessary for effective economical ripping . . .

ADJUST POINT ANGLE TO MATERIAL (TYPE AND CONDITION)

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THE NEW ALL FORGED HIGH ALLOY STEEL NO. 36 RIPPER POINT

A ONE-PIECE

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OF NEWLY FORMULATED SUPER STEEL WITH UNIFORM GRAIN FLOW AND CONSTANT HARDNESS FROM CORE THROUGHOUT POINT—GIVING UNBELIEVABLE WEAR RESISTANT ENDURANCE

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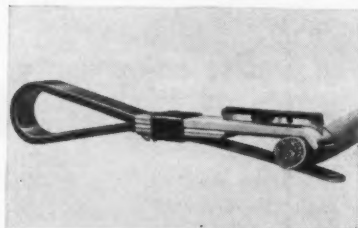
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SPECIALISTS

SPECIALIZING IN THE MANUFACTURE OF
 BETTER DIGGING POINTS FOR OVER 30 YEARS

New Equipment News (Continued)

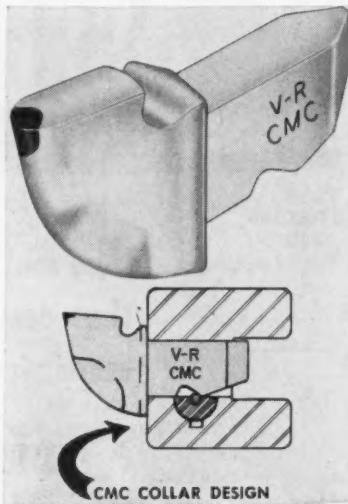
operation at 50 psi continuous pressure; two-stage at 125 psi. Major features are said to include individual cylinders made of nickel-iron alloy with deep radial fins and unloaders of suction-valve type which hold intake valves off seats when pressure reaches maximum setting. When pressure drops 10 psi, valves are released to operate from an adjustable pilot control valve. Automatic start-stop or dual controls are also offered. Davey Compressor Co., 600 Franklin Ave., Kent, Ohio.



Cable Tool Makes "Ring Cut"

Simple operation is one feature of Cable Tool No. N-2060 for ring cutting the sheathing of "inside type" plastic- or rubber-covered cable. Most practically suited for customary inside type $\frac{3}{16}$ -, $\frac{1}{4}$ -, $\frac{5}{16}$ -, or $\frac{1}{2}$ -in cables, this tool will also handle thin-sheathed cable up to 1-in diameter. Cuts are always $\frac{1}{32}$ -in deep. Price is \$7.40 each. A cable Sheath Slitter No. N-62267 for slitting

the cable lengthwise after circular cutting is also offered at \$4.20 each from P. K. Neuses, Inc., 511 N. Dwyer St., Arlington Heights, Ill.



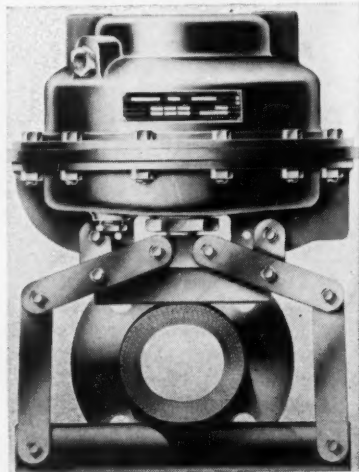
New Bit Design

An all-around collar is featured on the latest design Style CMC Red Bit announced by Vascoloy-Ramet Corp., Waukegan, Ill. Bit, lug and retainer pin life are said to be greatly increased due to the bit's perfect fit in quick change block. The collar bears equally on all sides—bit seats solidly with no wobble for uniform wear on the lug. Because

the collar keeps fines from packing in the lug, bit changes are quicker and easier. With a cylindrical carbide tip brazed into a cylindrical pocket, this bit can withstand extremely rugged cutting conditions, according to the manufacturer.

Automatic Pinch Valve

To control highly-abrasive slurries and corrosive materials in locations too hazardous or inaccessible for manually-operated valves, a "Ful-Flo" Flex Valve



is available from Farris Flexible Valve Corp., 586 Commercial Ave., Palisades



Tractor Loader

Biggest of six tractor-loaders in Allis-Chalmers' line is the new TL-30. It features a 10,500-lb carrying capacity and a maximum lifting capacity of 25,000 lb. A single-lever power shift permits shifting on the go at any speed and in either forward or reverse. Powering this 4-wheel drive unit is the Allis-Chalmers turbocharged "11000" diesel engine with a rating of 184 hp at 2,200 rpm. Six buckets from 2½ to 6 cu yd are

offered. Bucket and linkage design gives unit a breakout force of up to 28,000 lb and a 42-deg tip-back at ground level. Some other features are a maximum dumping clearance of 10 ft 4½ in. and a 37½-in reach forward from the tires for center loading of high, wide truck bodies. For further details write the company at 986 S. 70th St., Milwaukee 1, Wis.

Single or Two-Stage Compressor

A stationary compressor in 3- or 6-cyl models to deliver 50 or 125 psi air at displacements from 260 to 1,080 cfm has been developed by Le Roi Div., Westinghouse Air Brake Co., Sidney, Ohio. Although similar in design to the conventional two-stage compressor, extra valves and manifolding have been inserted to permit single- or two-stage operation within the same machine.

Air passes through manifolding and cylinders for both single- and two-stage operation, during single-stage operation atmospheric air enters the center cylinder bank directly and is discharged at 50 psi.

To convert from single- to two-stage operation and vice-versa in either unit, stop the compressor, blow down the receiver and change the setting on each three-way valve.



Production lost by accidents like this can cost more than the original cable. The exceptional crush-resistance of Anaconda flat shuttle-car cable repays your cable investment many times over by assuring minimum downtime.

Even if this should happen, flat Anaconda shuttle-car cable stays on the job

When a machine runs over Anaconda *flat* A-C or D-C shuttle-car cable, its weight is spread evenly over all the conductors, instead of being concentrated at a few points, as it is with round cable. The conductors won't shift under the jacket, because the insulation is shaped to fit the jacket exactly—D-shaped on the outside conductors and square on the center conductors.

The flat shape is safer for personnel, too, because it won't roll when stepped upon.

Inside, nylon breaker strips separate the insulated conductors, for extra crush resistance and less chance of conductor-to-conductor shorts. Tough Neoprene insulation, color-coded for easy identification, reduces conductor cutting action to a minimum. A specially compounded Neoprene jacket, which has proved its

abrasion resistance through years of service, is reinforced by a rugged nylon web. For A-C service special grounding conductor construction lets you use ground trip relay systems.

For more information about Anaconda flat shuttle-car cable for A-C or D-C systems, contact the Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York, Department EFL-1-CA.

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ASK THE MAN FROM
ANACONDA®
FOR FLAT SHUTTLE-CAR CABLE

cut coal handling costs...
stop ground storage losses...
save valuable space
with a



Marietta Silo System at Hampton
#4 Plant, Westmoreland Coal
Company, Clothier, W. Va.

MARIETTA SILO STORAGE SYSTEM

Marietta industrial coal silos provide rugged storage anywhere... at the mine... in the yard... at the plant. That's because they're designed to store coal safely and to fit perfectly into a materials handling system engineered to your precise requirements. For example, run of mine coal can be moved from your mine directly into your surge silo, then to cleaning plant and on to storage silo, truck, barge or railroad car... or by conveyor belt from mine to plant site... with virtually no expensive hand operation. Marietta storage systems save space, too, because they can be installed anywhere... and support heavy super structures and equipment loads. Marietta Silos eliminate fire hazards, cut insurance rates. For safe, economical coal storage... anywhere... plus fast handling, no storage loss and increased profit, let Marietta engineers design a system to meet your exact needs... for information, write

Marietta



CONCRETE
DIVISION

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Marietta, Ohio

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New Equipment (Continued)

Park, N. J. It has a simple pipe-like body which provides full capacity and unobstructed flow and will not plug. Smooth bore is said to minimize incrustation permitting easy cleaning by tapping with a mallet. The flexible, freeze-proof body absorbs vibration and is unaffected by water hammer. A diaphragm motor permits automatic control.

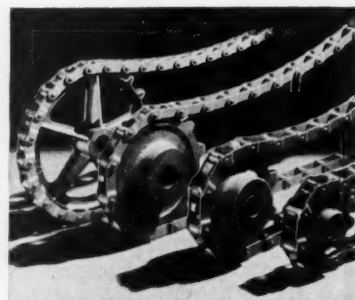
COOLING SYSTEM—Now available for 14 International engines, is the "Flo-Matic" cooling system for non-radiator cooled engines. Seven of the engines are 6-cyl carbureted units, three are V-8 carbureted and four are 6-cyl diesels. This system is said to maintain a high-volume, high-velocity coolant flow, producing more uniform engine temperatures which remain constant regardless of load or ambient temperatures. International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.



CORE DRILL AND AUGER—Designated the "Acker SP," this heavy-duty, truck-mounted combination core drill and auger is in production at the Acker Drill Co. plant at Scranton, Pa. Capacities are: augering to 300 ft; core drilling to 1,500 ft; holes up to 24 in in diameter. Features include a 4-speed cathead hoist, built-in reverse, 4-speed transmission, hydraulic drill head, etc. Unit is completely self-contained with its own power plant, built-in tool bins, water tank and hydraulically-operated mast and leveling jacks.

PRODUCTION WELDER — A semi-automatic production welder for use on both machinery and structural fabricating is being produced by Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio. The "Innershield Squirt Welder" continuously feeds a tubular, self-shielding electrode through a welding gun that is manually supported and guided along the joint being welded.

Power for the welding range of 350 to 600 amps is supplied by a DC motor generator. Safety feature is a metal shield located on the gun between arc and gun handle to protect operator's hand from heat.



STEEL CHAIN—A new type of steel pintle chain has been developed and patented by Locke Steel Chain Co., 1230 Sabine St., Huntington, Ind. Especially useful in applications requiring capacities exceeding those of steel detachable chain where roller or malleable pintle chain might be specified, the new "600" Series is produced in four sizes—662, 667, 667-H and 672 to standard steel detachable chain pitches.

Equipment Shorts

Steels — High strength columbium-treated steels with added atmospheric corrosion resistance are being marketed by Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.

Speed Reducer—Latest addition to the line of Torque-Arm speed reducers by Dodge Mfg. Corp., Mishawaka, Ind., is a Size 17 single-reduction unit with 5:1 gear ratio capable of transmitting 50% more horsepower at output speeds up to 400 rpm.

Thread Lubricant — "Ferulube," a thread lubricating compound packaged in 1-lb cans and now offered in 8-oz tubes, is said to reduce wrench torque in the make-up of "bite" type tube fittings such as "Ferulok," and provide a protective film that prevents galling in stainless steel parts. Write to H. L. Sullivan, Parker Fittings & Hose Div., Parker-Hannifin Corp., 17325 Euclid Ave., Cleveland 12, Ohio.

Bonding Metals — For joining dissimilar metals and hard-to-weld steels, "Hardalloy 120" has been developed by McKay Co., 1005 Liberty Ave., Pittsburgh 22, Pa. Reported to be an excellent build-up material and work harden under repeated impact, "120" deposits have a controlled ferrite level of about 12%.



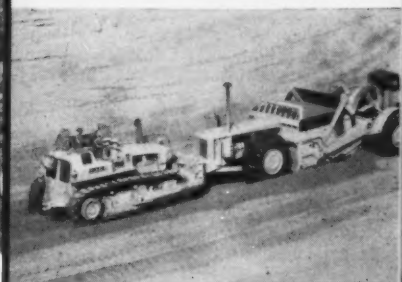
Work-ability of "EUC" Crawlers Steps Up Production on Tough Stripping Jobs

Euclid's modern crawlers—the 211 net h.p. Model C-6 and the Twin-Power Model TC-12 with 425 total net h.p.—have set new standards of tractor production in mine and quarry work. With performance proved Torqmatic Drive, both of these crawlers have excellent maneuverability and fast response that cuts work cycle time. They're engineered for easy service accessibility that results in less downtime and lost production.

Have your dealer give you all the facts on these "Euc" tractors...he'll show you the features that pay off in better production on every stripping job, whether it's heavy dozing or ripping work, push loading big scrapers, or moving coal, ore and other materials.



At a coal stripping operation in Pennsylvania, this TC-12 removes overburden at a rate of 400 to 500 yds. per hour. It is equipped with 16' blade...works two 8 hr. shifts a day.



Euclid Twin-Power teams — TC-12 Crawlers and T5-24 Scrapers — move over a million yds. a month at this Wyoming open pit uranium operation.



Model C-6 crawler back-filling overburden in the pit... full-power shift, good visibility and fast response make this "Euc" a high production machine for mine and quarry work.



EUCLID

DIVISION OF GENERAL MOTORS, HUDSON, OHIO
Plants at Cleveland and Hudson, Ohio and Lanarkshire, Scotland

STEARNS INDOX V Magnetic Separators Make Believers Out of Customers ... Competitors, Too

Amazing new permanent magnet material provides important efficiency improvements at lower cost in coal cleaning applications.

Before 1958, users of magnetic separation equipment had no choice but to buy electromagnetic units when the job required a deep and powerful field. Then from Stearns came INDOX V—a permanent magnet material which not only provided the field strengths needed but permitted separator designs that were less costly to install, maintain and operate. Further, INDOX V-equipped wet drum separators and permanent magnetic head pulleys are not subject to the costly, time-robbing breakdowns encountered with electros as a result of insulation failure due to moisture.

INDOX V Opens New Design Era

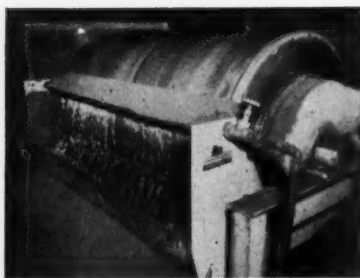
But what is INDOX V? It is a highly oriented barium ferrite ceramic magnet material developed by Indiana Steel Products, Division of Indiana General. INDOX V possesses unique advantages for separator design—lightweight, high electrical resistivity, great resistance to demagnetization (stable to -40°C), and high magnetomotive force per unit of length. Made of low-cost, non-critical raw materials, INDOX V supplies an energy product, on an equivalent weight basis, equal to ALNICO V and three times greater than that of ordinary un-oriented ceramic magnet material.

Design Experience Pays Off — For You

Because of the increased design flexibility and other advantages offered by INDOX V, Stearns engineers were able to achieve dramatic improvements in separator efficiency with the added bonus of low cost.

For example, with the advent of INDOX V it became both *practical* and *economical* to employ permanent magnet radial pulleys on heavily loaded conveyors requiring diameters up to 48" — jobs that previously required expensive electro units.

Stearns pioneered the development of the first permanent magnet wet drum



INDOX V-equipped wet drum separator provides unequalled magnetic media recovery in large coal-processing plant — delivers up to 70% solids content.

separators for heavy media applications, using ALNICO V. Then, recognizing the design and cost benefits to be gained with INDOX V, we again pioneered the industry switch to these even more efficient, less costly ceramic-equipped units. Today, Stearns, with a large number of job-proved installations, is the recognized leader in this type of HMS equipment. The recent widespread change-over to ceramic permanent magnets in the magnetic separation equipment industry gives further proof of the success of INDOX V in these applications.

Broadest Equipment Line

Stearns offers a complete line of job-proved INDOX V-equipped wet drums, pulleys and complete pulley separator units to handle any coal cleaning application — from removal of tramp metal to recovery of magnetic media. And, for those jobs that require frequent variation of field strength, we continue to offer electro separators, including a brand new line of suspended magnets, employing the latest in both electrical and mechanical design.

To take advantage of this unmatched experience, call in a Stearns engineer today for a *job-studied* recommendation and price quotation. Literature sent on letterhead request.

New Equipment (Continued)

Grouser Bar—A grouser bar, claimed to be the world's largest, to fit Caterpillar D8 Series H and D9's, Euclid TC12's, International TD25's and Allis-Chalmers HD21's, has been announced by Allied Steel & Tractor Products, Inc., 7835 Broadway, Cleveland 5, Ohio. The new F-3 grouser is $2\frac{1}{2}$ in high, 1 in wide (overall) and weighs about 5.3 lb per ft.

Floor Plate—Designed for resistance to abrasion and impact, "Jal-Tread" floor plate rolled from high strength steel grades has been introduced by Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.

Lubricating Stick—"Molykote" lubricating sticks, containing molybdenum disulfide solid lubricant in a resin binder, are particularly useful on grinding wheels and cutting tools, according to the manufacturer, Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn. Typical extreme-pressure applications of the product are subject of data sheet offered.

Free Bulletins

Mechanical Conveyors—For your new vibratory Mechanical Conveyor catalog section write Syntrol Co., 975 Lexington Ave., Homer City, Pa.

Carbide Bits—Copy of "Carmet Cemented Carbide Mining Tools" can be had by writing Carmet Div., Allegheny Ludlum Steel Corp., Wanda & Jarvis St., Detroit 20, Mich.

All Steel Products—Nolan Co., Bowers-ton, Ohio, has published Nolan No. 10 catalog, well illustrated with latest product developments for the mining and industrial fields. New products include all-steel push cars, tool and supply car, track dolly carry-cart, rail dolly, bumping posts, etc., as well as the standard Nolan line of rerailers, derailleurs, car-door openers and other railroad and industrial items.

Air Separators—Copies of Bulletin 90 covering in great detail single and double mechanical air separators can be obtained by writing Raymond Div., Combustion Engineering, Inc., 427 W. Randolph St., Chicago 6, Ill.

Air Cleaner—Low-resistance Model C Type P Cycoil industrial oil bath air cleaner with new pneumatic oil lift is discussed in Bulletin 160-C available upon request from Dept. PD, American



STEARNS MAGNETIC PRODUCTS

635 South 28th Street

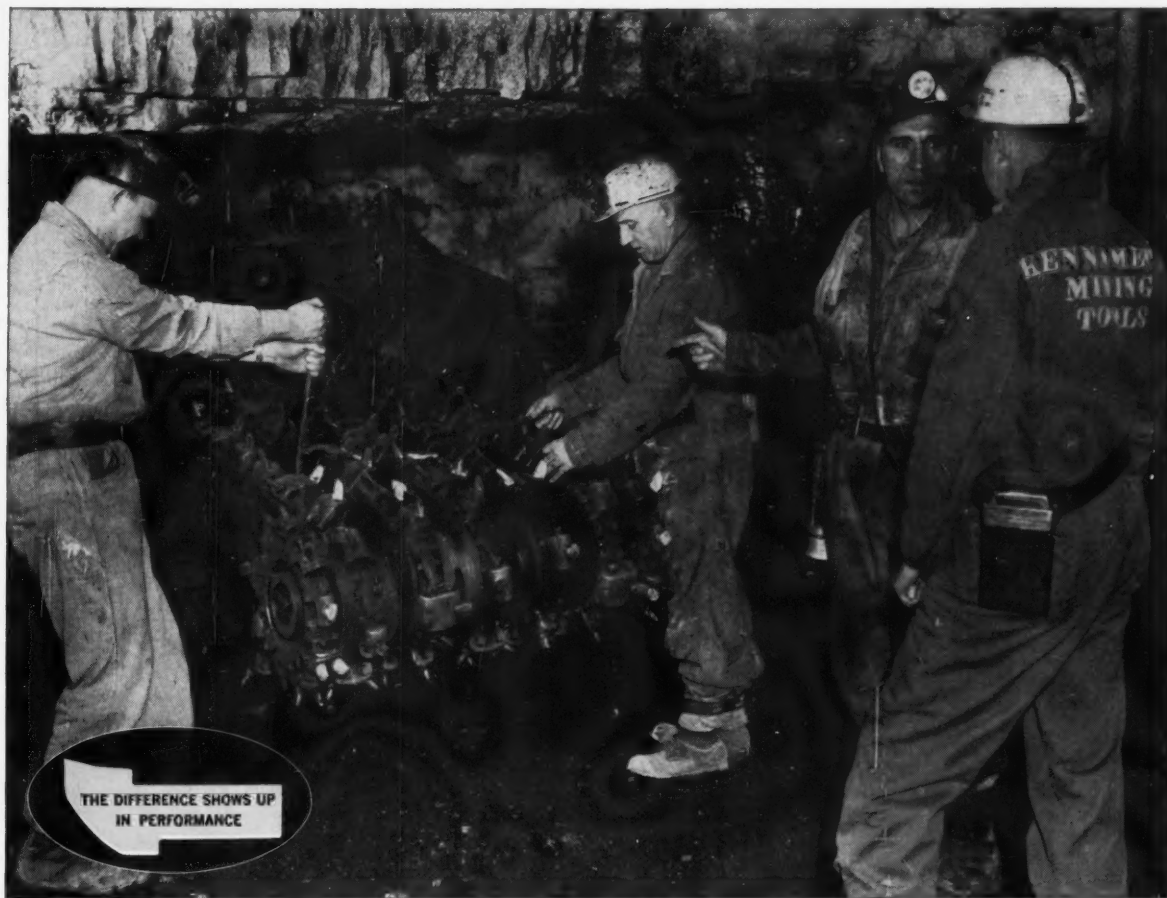
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DIVISION OF INDIANA GENERAL CORPORATION • VALPARAISO, INDIANA

Profit with Stearns — First with Ceramic Magnet Separators for Industry



Pennies invested in bit cost per ton... gain dollars in tonnage per shift

That's what happened when one operator decided to try Kennametal* cutter bits. Although his bit cost increased four-tenths of a cent per ton, production increased 82 tons per shift on the test section. This exceptional 33 per cent increase in tonnage was attained in a 98-inch seam containing large amounts of impurities.

This is another example of how the superior performance of Kennametal cutter bits is helping operators get maximum efficiency from costly machines.

Kennametal bits are designed to *cut* coal—not rub it. Kennametal carbide inserts are harder and hold a cutting edge longer. That's why they cut coal faster, require fewer bit changes and less bit regrinding. Time saved underground means more tons above ground.

Bit costs alone are misleading as it's the total cost of getting coal above ground that really counts. If you look at your over-all production figures, you may find that a few cents invested in bit cost may pay off in dollars by keeping your machines producing more

*Trademark

minutes per shift. The big difference shows up in bit performance . . . not bit cost.

For a check on how the superior performance of Kennametal bits may help improve production and profits at your mine, call your Kennametal Representative or contact us direct. KENNAMETAL INC., Mining Tool Division, Bedford, Pennsylvania. Phone 623-5134.

33594

Comparative bit costs per ton versus tonnage mined involving Kennametal and competitive bits—based on a company's test report of actual coal mining operation.

Over-All Bit Cost Per Ton	Tons Mined Per Shift
Kennametal..... 3.5¢	Kennametal..... 331 tons
Competitor..... 3.1¢	Competitor..... 249 tons
0.4¢	82 tons
Kennametal is 0.4¢ higher.	Kennametal bits produced 82 tons more coal per shift.



See our display at the Coal Show—Booth 1818



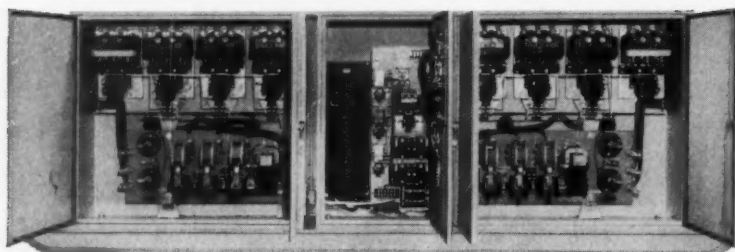
INDUSTRY AND
KENNAMETAL
... Partners in Progress

ENSIGN-CLARK

AC MAGNETIC
WOUND ROTOR
DUAL DRIVE

MOTOR STARTERS

FOR BELT CONVEYORS



Photograph illustrates an Ensign-Clark Bul. 26100 non-reversing starter for controlling two 125 H.P., 440-volt, 3-phase, 60-cycle AC wound rotor motors.

NEMA V enclosure. Resistors in separate compartments on rear not shown in photograph. Controls for operating both motors at once or independent of each other are seen in separate center compartments.

ENSIGN - CLARK

AC MAGNETIC STARTERS ARE ALSO
AVAILABLE IN MANUAL REVERSING AND
MAGNETIC REVERSING

OPTIONAL FEATURES:

- NEMA I Dust-tite or Bureau of Mines Construction.
- Circuit Breaker Disconnect.
- Belt Slippage Protection when used with Ensign Centrifugal Switch.
- Control Circuit Transformer.
- Sequence operation when used with Ensign Centrifugal Switch.
- Motor Disconnect Plug.
- Skid Mounting.

ENSIGN

ELECTRIC AND

MANUFACTURING CO.

914 Adams Avenue



Huntington 4, W. Va.

New Equipment (Continued)

Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.

Rotary Compressors—Latest models of Davey 600 cfm rotary compressors are subject of Form E-263 issued by Davey Compressor Co., Kent, Ohio.

Arc Welding—"Weldirectory of Arc Welding Electrodes, Equipment & Supplies" is title of Bulletin 7000.7 published by Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio. Data on AWS electrode classification and correct electrode selection is included.

Motor Drives—Catalog G-100, 88 pp, gives complete information on the entire line of Reeves Vari-Speed Motor-drives ¼ through 40 hp. Write Reliance Electric & Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio.

Pump—For general information on the Gorman-Rupp Co. 3-in electric motor-driven Submersible Dewatering Pump, ask for Form 1-VS-11 from the firm's Adv. Dept., 305 Bowman St., Mansfield, Ohio.

Hardened Parts—"Tool Steel Process" hardened products, made by Tool Steel Gear & Pinion Co., Dept. V, Cincinnati 16, Ohio, are reported to save money and give longer service in strip mining production. Bulletin 857.

Dryer—Fluid-Flo dryers and how they work are described in Folder 2909 released by Link-Belt Co., Dept. PR, Prudential Plaza, Chicago 1, Ill. A separate insert entitled "Dryer and Cooler Data Sheet" is being distributed with the folder.

Nuclear Control Systems—Details of basic systems employing nuclear gages for controlling specific gravity or density and liquid or interface levels are contained in literature offered by Ohmart Corp., 2236 Bogen St., Cincinnati 22, Ohio.

Dragline Bucket—Latest brochure from Page Engineering Co. covers Page "Automatics" in the 4- to 7-cu yd range series in two groups—general purpose and heavy duty. Clearing P. O., Chicago 38, Ill.

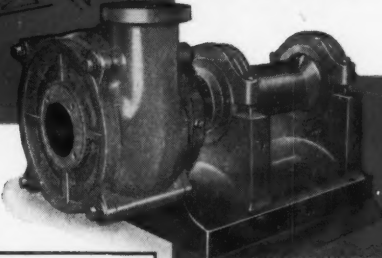
Scale Maintenance—Causes of scale error and steps required to eliminate it are outlined in 8-p booklet issued by Howe Scale Co., Rutland, Vt.

Air Tools—A 48-p catalog on contractor and mining air tools manufactured by Thor Power Tool Co., 175 N. State St., Aurora, Ill., is now available. Address Adv. Dept.

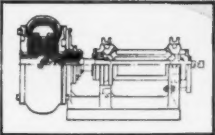
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**CENTRIFUGAL
PUMPS**



DURABILITY PLUS
...by using the same
longer lasting LINATEX
that adds 5 to 6 times to
the life of conveyors, chutes,
launders, hoppers, etc.

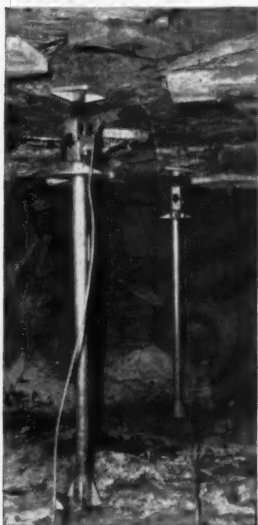


(SIZES 1" through 12")

COLD BOND—ON SITE APPLICATION
For information and quotations please write:

LINATEX CORPORATION OF AMERICA
P.O. DRAWER "D", STAFFORD SPRINGS, CONN.

RECOVER ROOF BOLTS WITH SIMPLEX



ROOF BOLT RECOVERY JACKS (M279)

- two men easily recover 350 bolts per day
- 24" rack bar travel
- high strength aluminum alloy column and castings
- light weight
- 4 sizes for all seam heights—min. height, 48 inches

SAFE, EASY-TO-USE

Place a Jack alongside each of the first row of bolts closest to the face. Raise to the roof to provide temporary support. Remove bolts by sugar or pneumatic tool. Stand 25' or more away and pull on a rope attached to the Jack trip lever which collapses the Jack. Move Jack to position under the next row of bolts and proceed as previously.

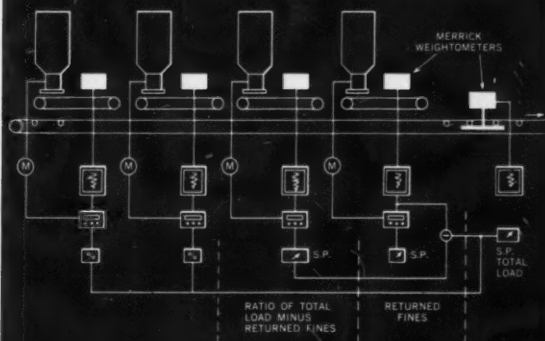
SEE YOUR
DISTRIBUTOR,
or write



TEMPLETON, KENLY & CO.
2501 Gardner Road, Broadview, Ill.

For precision blending of bulk materials AUTOMATICALLY...

*Here's how Weightometers can
automate a typical blending system...*



Loading is made at the set-point station, which imposes an output voltage signal to all ingredient control stations. All materials are controlled to a percent of the total load required. Recoverable material set-point is determined by returned product available. Feed is controlled by difference of returned material and total load of master set-point.

Merrick WEIGHTOMETERS®

not only weigh and record the amount of material passing along a conveyor, they can be used to automate complete production systems. The blending system diagrammed above is typical. Integrating and recording arrangements can be electronic, mechanical or electro-mechanical.

Write us today for complete information.

Merrick

more than fifty years of "firsts" in automatic weighing
MERRICK SCALE MANUFACTURING COMPANY
180 Autumn Street • Passaic, N. J.



All five units in this stockpiling-reclaiming Barber-Greene belt conveyor system are shown here ... the unloading conveyor ... cantilevered

radial stacker ... two reclaiming conveyors ... and the enclosed conveyor atop bunkers that fills bunkers automatically.

At new Steam Plant in Sarnia, Ontario:

AUTOMATED BARBER-GREENE STOCKPILE

One man controls Canada's highest-capacity steam plant coal handling system

Dow Chemical of Canada, Limited specified and got a stockpiling-reclaiming belt conveyor system as ultra modern as the rest of its new steam plant at Sarnia, Ontario.

Working as a team, Dow Chemical and Barber-Greene engineers designed an automated conveyor system that can stockpile 20,000 tons of coal in eight hours at 2,500 tph. The bunkering conveyor system reclaims, crushes, samples and weighs coal before delivering it to steam plant bunkers at 440 tph.

Self-unloading ships deliver coal to a special dock on St. Clair River and feed it at high speed into a 20' x 20' hopper. The hopper feeds a 60" x 325' belt conveyor that moves coal at 670 fpm to a cantilevered radial stacker. This special 110' stacker with 60" belt stockpiles in a 150° arc.

Material is reclaimed on a 170' tunnel conveyor under the pile that feeds the crusher. Tramp iron is removed by a magnetic head pulley on the conveyor, and the coal is discharged into the crusher. A 319' conveyor fed by the crusher moves the coal over an automatic weighing device to a 115' tripper conveyor that automatically charges the bunkers.

Get the same very special attention for your bulk materials handling problems, no matter how complex or commonplace, by calling in your Barber-Greene Conveyor Representative.

Your belt conveyor equipment headquarters.

Representatives in Principal Cities of the World

Barber-Greene

Main Office and Plant AURORA, ILLINOIS, U. S. A.
Other Plants: DeKalb, Milwaukee, Detroit, Canada, England, Brazil, Australia

CONVEYORS • LOADERS • DITCHERS

ASPHALT PAVING EQUIPMENT



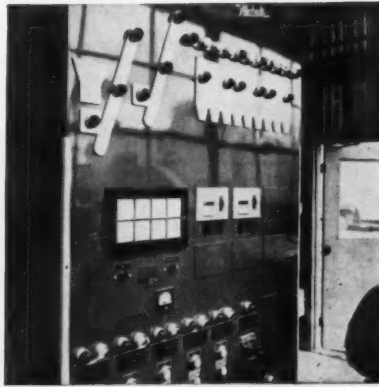
Huge coal ship spends minimum time at river bank dock because high-speed Barber-Greene stockpiling conveyors can transfer

20,000 tons of coal to stockpile in eight hours. Utilization of many control devices makes system both automatic and safe to operate.

BELT CONVEYORS COAL AT 2,500 T.P.H.



Specially-designed counterweighted radial stacker is supported only at tail end. By means of level indicator and timer, it automatically moves to new position each time coal reaches head of stacker. Both stacker and conveyor feeding it can be stopped from any point by operator. Conveyor system's 800-1,200 hour lube interval minimizes maintenance needs.



Entire operation is automatically controlled from two master control panels. Panel lights indicate operating status of all equipment in system.

Among the Manufacturers

Bucyrus-Erie Co. recently appointed **Howard Freyensee** general products sales manager and **Robert P. Brooks** large machine sales manager, succeeding



Freyensee



Brooks

Mr. Freyensee, joining Bucyrus-Erie's sales organization in 1945 as a special apprentice, Mr. Freyensee was later attached to the Atlanta, Ga., and Chicago sales office in South Milwaukee early in 1958 as sales development manager, commercial cranes and excavators. Mr. Brooks is a 15-yr veteran in the excavating and drilling equipment manufacturer's sales department having begun as a special apprentice. He has held positions as sales representative, Northwest district sales manager, assistant sales manager and sales manager at various company offices.

With the retirement of **Albert W. Holmes**, after 38 yr of service, **Link-Belt Co.** has appointed **Robert W. Miller** as assistant sales manager of the Pershing Road plant in Chicago. Mr. Miller had been an industry specialist at Pershing Road since 1955 and previous to that had served in the New York and Detroit offices.

J. T. Pitts, formerly Southwest regional manager, has been made sales manager, **Brown Instruments Div., Minneapolis-Honeywell Regulator Co.** Joining Honeywell in 1945, Mr. Pitts held sales posts in Charlotte and Durham, N. C., before going to Houston where he was branch manager from 1952 to 1958. He succeeds **J. A. Robinson** who joins the firm's six-division Industrial Products Group to coordinate expanding activities in the metals-producing areas.

Formerly in charge of sales in the Salt Lake City area, **J. E. Van Stone** has become Cleveland district manager, **Hewitt-Robins Incorporated**. Marketing of the company's conveyor machinery, power transmission equipment and industrial rubber products will be his responsibility.

Appointment of James A. Greene as regional manager, industrial sales, **Davey Compressor Co.**, has been announced. Affiliated with Davey for 14 yr, Mr. Greene will direct sales and service on Davey industrial compressors of 2 to 150 hp in Ohio and the Pittsburgh trading area. He will make his headquarters in Kent, Ohio.

Douglas M. Smith has been appointed marketing manager of mechanical goods division, **U. S. Rubber Co.** Formerly Eastern regional sales manager of the division, he joined the firm in 1948.

Wm. H. Newton has been picked to head **Western Machinery Co.**'s newly



Newton

created **Projects Dept.** Mr. Newton and his group will specialize in the design, engineering and installation of complete **WEMCO** equipment "packages" and "processing systems" for the minerals, coal, chemical, paper and food processing industries. Start-up assistance and training of operating personnel will also be offered. This service will be available to **WEMCO** equipment users and to engineering-contracting firms.

Robert G. Allan Jr. and Thomas R. Westrope have been appointed district sales representatives for the **Trojan tractor shovel line, Yale & Towne Mfg. Co.** Mr. Allan's territory will include Kentucky, Michigan, Ohio, all of Pennsylvania west of Harrisburg and West Virginia. Mr. Westrope will handle Illinois, Indiana, Iowa, Minnesota, eastern Missouri, Nebraska, North and South Dakota, Wisconsin and Manitoba in Canada.

Myron Geller has been named sales manager of the **Wheel Excavator Div., Wellman Engineering Co.** Mr. Geller will assume full responsibility for promotion and sales of the division's recently-acquired **Demag-Lauchhammer** line of wheel excavators, reclaimers and stackers in the U. S. and Canada as well as the newly-developed barge wheel unloader.

Dr. Robert B. Booth has been promoted to manager of **American Cyanamid Co.**'s mining chemicals research and development section. Located at the Cyanamid research center in Stamford, Conn. where he was formerly a group leader, Dr. Booth authored many U. S. patents in the field of mining chemistry.

ON THE SPOT

CABLE REPAIR

REPAIRS CABLE JACKETS

FLEXIBLE - EASY TO REEL

JOINS CABLE

ATTACHES PIG TAIL LEADS

FACTS ABOUT THE CABLE-SAVER
A portable cable saver featuring the controls and flexibility normally found only on a non-portable vulcanizing press. Rugged platens with 750 watt heaters, each controlled by calibrated thermostat. Pilot lights indicate when dialed temperature is obtained. Front tie bar with single handle operates cam locks which swing down the tie bar to give full accessibility to the front opening of the press.

PHI PRESS
write for descriptive folder
PASADENA HYDRAULICS, INC.
1433 Lidcombe, El Monte, Calif.

NEW!

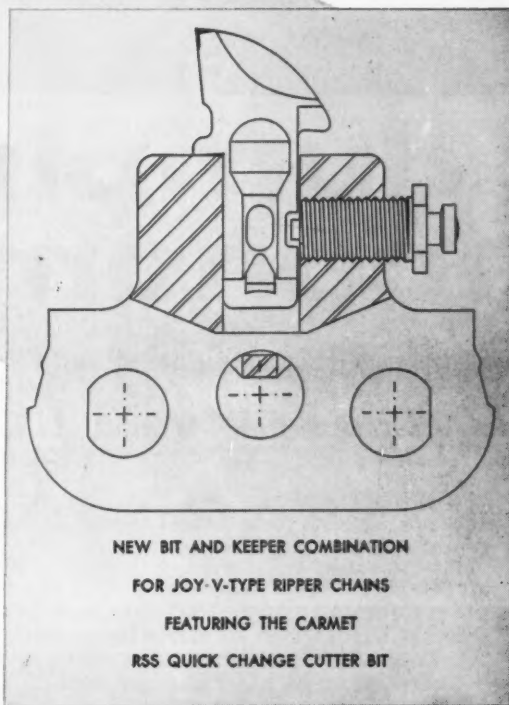
RSS QUICK CHANGE Cutter Bit slashes bit changing time 85%

For fast, easy bit changing, try the new Carmet® RSS Quick Change Cutter Bit with keepers in JOY V-type chains. Simply pry set screw plunger outward to retracted position (cutter bit is released instantly)—remove bit with free hand—replace bit—release plunger. Changing time is reduced 85%! Bit changes are just as fast in Bit Rings and Borer Blocks.

RSS Cutter Bits are designed for positive locking with JOY keepers. The threaded keeper plunger engages a forged notch in the tool shank, keeps the cutting tools locked firmly in place. No wobble, no battering of tool shank on keeper, no tools jerked out and lost.

And the RSS Cutter Bit is built to take abuse . . . with a beefed-up, load-bearing shoulder area that withstands higher cutting pressures . . . a plug-type carbide insert set at an angle that eliminates braze failure and insert loss . . . a full radius tip design that fully supports the insert, reduces breakage, permits harder grades of carbide.

The carbide, of course, is Carmet carbide . . . famous for quality. In fact, Carmet Division manufactures the complete mining tool, and their reputation depends on Carmet Tools being the finest available. There's a Carmet Bit designed for universal machines and continuous miners of every make, and your Carmet distributor carries a complete line in stock for prompt delivery. Call on him for help with your mining tool problem. *Allegheny Ludlum Steel Corporation, Carmet Division, Ferndale, Detroit 20, Michigan.*



NEW BIT AND KEEPER COMBINATION
FOR JOY V-TYPE RIPPER CHAINS
FEATURING THE CARMET
RSS QUICK CHANGE CUTTER BIT

2377

NEW CARMET MINING TOOL CATALOG NOW AVAILABLE

For your copy, contact one of these Carmet distributors or write Carmet direct.

UNITED STATES:

Birmingham Bolt Co., Birmingham, Ala.
Bluefield Hardware, Bluefield, W. Va.
Brace-Mueller-Huntley, Inc.
Offices: Buffalo, Rochester & Syracuse, N.Y.
Carlsbad Supply Co., Carlsbad, New Mexico
Cate Equipment Co., Pwce, Utah
Coalfield Co., West Frankfort, Ill.
Consolidated Supply Co., Picher, Okla.
Goodman Mfg. Co., Chicago, Ill.
G. F. Gharst Supply Co., Terre Haute, Ind.
Gladstein Co., McAlister, Okla.

Marion Mine & Mill Supply Co., Whitewall, Tenn.
McCombs Supply Co.

Offices: Harlan, Ky. & Jellico, Tenn.
Mine Equipment & Supply Co., Madisonville, Ky.
Oglebay Norton Mine Supply Div.
Offices: St. Clairsville, Ohio, Johnstown, Penna.
& Washington, Pa.

Peerless Supply Co., Des Moines, Iowa
Persinger Supply Co., Williamson, W. Va.
Persinger's, Charleston, W. Va.
W. B. Thompson Co., Iron Mountain, Mich.
Tri State Mine Supply Co., Uniontown, Pa.
Union Supply Co., Denver, Colo.
Vanguard Equipment Co., Chicago, Ill.
R. A. Young & Son, Inc., Fort Smith, Ark.

CANADA:

Joy Mfg. Co. (Canada) Ltd., Galt, Ontario
Joy Mfg. Co. (Canada) Ltd., Alberta, Calgary

NOVA SCOTIA:

Joy Mfg. Co. (Canada) Ltd., Sidney

AFRICA:

Joy-Sullivan (Africa) (Pty.) Ltd., Johannesburg

AUSTRALIA:

Joy Mfg. Co. Pty. Ltd., Mascot, N.S.W.

CARMET®

CEMENTED CARBIDE • DIVISION OF ALLEGHENY LUDLUM

SEE CARMET AT BOOTH 232 IN THE COAL SHOW



Parks



Gardner

W. S. Tyler Co. has announced two personnel appointments in its expansion program. Walter J. Parks has been made director of product development, Screen-

ing Div., and Edgar E. Gardner, chief engineer, Screening Machinery Div. Mr. Parks who vacated the post filled by Mr. Gardner, has been responsible for such significant development as the Ty-Rock Screen, Ty-Lock Rod Deck, Air Seal Enclosure and others in his 25 yr with Tyler. Mr. Gardner steps up from the post of assistant chief engineer, Screening Machinery Div., which he held for 9 yr.

William D. Messer has been named general sales manager, Leschen Wire Rope Div., H. K. Porter Co., Inc., and

will headquarter at the firm's main office in St. Louis, Mo. Formerly a sales manager with the Construction Div. of Huck Mfg. Co. in Detroit, Mr. Messer replaces R. Rex Hartup who has been appointed technical manager, Prestressed Materials.

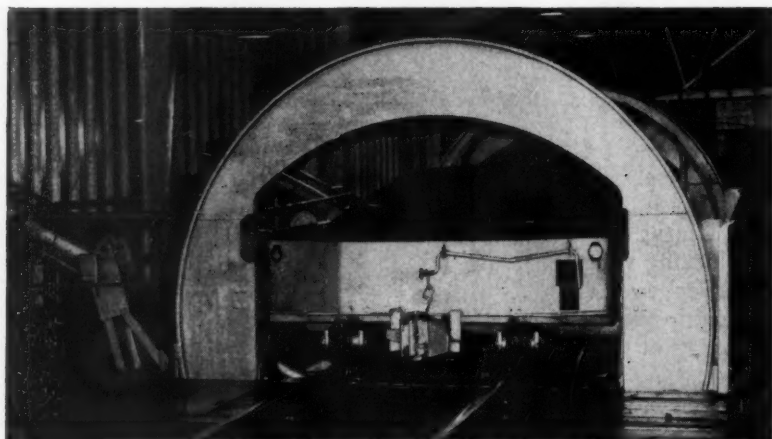
Lee L. Morgan succeeds retiring Henry H. Howard as vice president, En-



Morgan

gine Div., Caterpillar Tractor Co. He will also assume administrative responsibility for the company's Defense Products Dept. Since joining the firm in 1946, Mr. Morgan has supervised various advertising, sales and sales development functions and was named manager of Sales Development in 1958. E. C. Chapman, assistant Sales Development manager replaces Mr. Morgan as manager of Sales Development.

William C. Pietsch has been named product engineer in the mining machine section of the large machine division of Bucyrus-Erie Co. A 14-yr veteran in the firm's Engineering Dept., he was formerly a product engineer in the commercial crane and excavator division.



dumping economy...

Differential Rotary Car Dumpers (patented) used with Differential Mine Cars

Cost less: to purchase / to install / to operate / to maintain

Want proof? Just ask for it. First installation was made in 1946 and dozens more have been made since 1950—six for repeat customers.

Want speed? Spot cars with your locomotive, then complete dumping cycle—180° over and 180° back—in five seconds. Compressed air starts the operation—then gravity takes over. For long storage bins, dump several cars at once—capacities up to 2,000 tons per hour.

where can you match it?

Since 1915—
Pioneers in
haulage equipment



Company Briefs

Hutchinson Supply Co., Zanesville, Ohio, has been appointed an authorized mining tool distributor for Vascoloy-Ramet Corp. coal mining and percussion bits and blanks.

Marshall Supply & Equipment Co., 1719-A Towson Rd., Fort Smith, Ark., has been announced an authorized distributor branch office for "Carboloy" cemented carbide products of General Electric Co.'s Metallurgical Products Dept. Main plant and office in Tulsa, Okla., has been an authorized distributor since May, 1941.

New corporate name of McLanahan and Stone Corp. is "McLanahan Corp." The 126-yr-old producer of pit, mine and quarry equipment made the name change largely to eliminate the impression that it is a supplier of crushed stone, gravel or other materials. Today, McLanahan Corp. is a designer and producer of crushers for coal, ore and stone industries; washing equipment for sand, gravel, ore and related industries. It is also active in contract machining and as a producer of custom castings of iron and steel.

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this page with the confidence justified
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Consulting Civil and Mining Engineers
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Coal Land Development
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Beckley, W. Va. Charleston 1, W. Va.
Clifford 2-9338 Dickens 4-3573

MOTT CORE DRILLING CO.

Contractors-Manufacturers
Exploration of Coal Properties. Guarantee satisfac-
tory coal cores. Inside Mine Drilling. Pregroun-
ding. Mine Shafts. Large diameter holes.
Mott Bldg. 830 Eighth Ave.
Huntington 17, W. Va.

ATLAS RAILROAD CONSTRUCTION CO. *Railroad Track Specialists*

Engineering Construction
Maintenance
Express Highway West
Bentleyville, Pennsylvania

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Drill Contractors Since 1902
Specialists in exploratory—grout hole and pressure
groutings. Rigs located in over 50 strategic areas for
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DESIGN AND CONSTRUCTION
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SEARCHLIGHT SECTION

(Classified Advertising)

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BUSINESS:

"OPPORTUNITIES"

EQUIPMENT
USED OR RESALE

POSITION WANTED

Mining Engineer B.S. degree—married—age 36—
eleven years industrial engineering and mine
management experience (coal). First class Mine
Foreman papers. Presently employed. Location
unimportant for opportunity with growth poten-
tial. PW-6445, Coal Age, Classified Adv. Div.,
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STRIP COAL WANTED

Lease or Purchase—large or small tracts. Morgan,
Coal Company, 2850 North Meridian Street,
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Coal Utilization Technician

For Overseas Assignment

Technician qualified in marketing, distribu-
tion and utilization of coal required for six-
month assignment abroad. Must be specialist
in movement of coal from mine to market
and be thoroughly familiar with coal loading
and unloading devices.

Salary to \$16,875 per annum plus subsis-
tence and other benefits. Send complete
resume including past earnings to J. S.
Snyder, Room 3500, 20 N. Wacker Drive,
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WANTED

For one to two years assignment
in Far East . . .

Mining engineer with experience in
design, construction, shaft sinking
and mining highly inclined seams.

Mechanical engineer with design
and construction experience pre-
ferably on mining projects.

Electrical engineer with design and
construction experience preferably
on mining projects.

Shaft sinking foreman—must have
had responsible charge of major
project with concrete lining and
grouting.

Send full record to P6408 Coal Age, Class.
Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

CLASSIFIED

SEARCHLIGHT SECTION

ADVERTISING

EMPLOYMENT •

BUSINESS •

OPPORTUNITIES •

EQUIPMENT—USED or RESALE

DISPLAYED RATE

The advertising rate is \$12.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

EMPLOYMENT OPPORTUNITIES—\$26.00 per inch subject to agency commission.

INFORMATION:

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

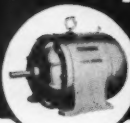
An ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page.

UNDISPLAYED RATE

(Not available for Equipment Advertising)
\$1.50 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See ¶ on Box Numbers.)

POSITION WANTED undisplayed rate is one half of above rate, payable in advance.
BOX NUMBERS count one additional line.

Send New Ads or Inquiries to Class. Adv. of Coal Age, P. O. Box 12, New York 36, N. Y., For June Issue Closing May 18th

POWER EQUIPMENT CO.
Offers**BARGAIN PRICES**ON GUARANTEED
NEW and Rebuilt
MOTORS!**MAY SPECIALS**

GUARANTEED REBUILT MOTORS
230 Volt DC Compound Wound
Unless Otherwise Noted

HP	MAKE	TYPE	SPEED
150	G.E.S.B. Open	RC	900
100	West. S.B. Drip	SK-143L	1800
100	West. S.B. Open	SK-142L	1800
100	West. S.B. Open	SK-170	900
75	West. S.B. Open	SK-160	900
60	GEBB Drip	CDN-95	1800
60	Al. Chol. S.B. D	DE-131	1200
40	L.A.B.B. Splash	FNA-405	1800
40	Con. BB D NW	DN-375	1800
30	West. BB D. NW	SK-93	1800
30	L.A.B.B. Drip	OGNA-404	1800
25	GEBB Shunt	CD-93	1200
25	Cont. S.B. Drip	D-364	1800
10	West. S.B. Drip	CSP-324	1800
7 1/2	GE TEFCBN N	B-284	1800
	SGEBB Drip	B-254	1800

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Cash for your surplus new &
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Send your list today.

Large line of motors, control equipment, AC
& DC Generators, MG sets and transformers.

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9-W B.E. Elec. Drag, 200', 8 yd. or 160', 10 yd.
9-W B.E. Diesel Drag, 165', 12 yd.
7-W B.E. Diesel Drag, 140', 7 yd.
7400 Marion Diesel Drag, 175', 13 yd.
71-B B.E. Crane with 160' boom
825 Page Diesel Drag, 130', 10 yd.
631 Page Elec. Drag, 200', 8 yd.
621-S Page Diesel Drag, 125', 7 yd.
200-W B.E. Diesel Drag, 125', 6 yd.
2400 Lima Elec. Drag, 130', 6 yd.
2400 Lima Diesel Drag, 130', 6 yd.
7200 Marion Diesel Drag, 135', 5 yd.
4500 Manitowoc Drag, 120', 5 yd. & 140', 4 yd.
120-B B.E. Elec. Drag, 115', 5 yd.
111-M Marion Drag, 100', 4 yd.
1055 P&H Diesel Drag, 80', 4 yd.
1601 Lima 4 yd. Shovel/Drum
3900, 3500 & 3000 Manitowoc Cranes
5560 Marion 25 yd. Elec. Shovel
5323 Marion 18 yd. Elec. Shovel
190-B B.E. 8 yd. Elec. Shovel
151-M Marion 7 yd. Elec. Shovel
1600 P&H 6 yd. Elec. Shovel
170-B B.E. 6 yd. Elec. Shovel
4161 Marion 6 yd. Elec. Shovel
2400 Lima 6 yd. Std. H. L. Shovels
120-B B.E. & 4121 Marion 4 yd. Elec. Shovels
4500 Manitowoc 5 yd. H. L. Shovel
1055 P&H 3 yd. H. L. Shovel
1201 Lima 3 1/2 yd. Standard Shovel
111-W Marion Standard & H. L. Shovels
3500 Manitowoc Standard & H. L. Shovels
54-B B.E. Standard & H. L. Shovels
Model T-650 REICHDrill Truck Mtd. Rotary &
Down-The-Hole
Ingersoll-Rand Truck Crawler Mtd. Drillmasters
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100—70 ton cap. Covered Hopper Cars
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100—ACF Rotary Dump Stub Axel All Steel Mine
Cars
56 1/2" Track Gauge
32" High—7' 0-3/4" Wide—12 1/4" Bumper to
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16" Wheels—Timken Roller Bearings
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1947 Model 111M, 4 yd. Diesel Electric Power
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Le Tourneau Model CP-1. Six wheels with
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THE FOLLOWING IS A PARTIAL LISTING OF EQUIPMENT FOR SALE AT THE MINE SITE

SHUTTLE CARS, 250 VOLTS DC

- 11—Joy 10SC Shuttle Cars, right and left hand drive.
- 3—Joy 42-D Battery Shuttle Cars complete with batteries and chargers.
- 2—50E-10 Joy Shuttle Cars, 250 Volts DC, Disc Brakes, Elevating Discharge, completely modern, in excellent condition. Matched Pair.
- 2—10SC-1F Joy Shuttle Cars, 500 Volt DC, completely modern, excellent condition.

CUTTING MACHINES, 250 VOLTS DC

- 4—10RU Joy Cutting Machines
- 5—324 AA Goodman Slabbers—Track Gauge 42"

CONTINUOUS MINERS

- 2—Goodman Type 402 Continuous boring machine, 250 V. D.C. Serial #524 and #536 USBM permissible. Complete with new parts inventory and space assemblies. Excellent modern machinery.

TROLLEY LOCOMOTIVES, 42" TRACK GAUGE FOR 250 VOLTS DC

- 1—13 ton Goodman — Type 81A04T, completely modern
- 1—Goodman 13 ton 136B-0-4-6 with 2—75 H.P. Motors
- 2—13 ton Jeffrey Locomotives, (1—inside frame and 1—outside frame)
- 1—Goodman 5 ton 3013 with 1—50 H.P. Motor.
- 4—8 ton 132AK42-48R Goodman with 2—50 H.P. Motors with reels.
- 1—8 ton 32-0-4-T Goodman with 2—50 H.P. Motors with reels.
- 1—8 ton LM2-8-DD General Electric with 2—50 H.P. Motors with reel.
- 3—6 ton LM2-T-6MM General Electric with 2—35 H.P. Motors with reel.
- 2—6 ton LM2-4-6-11 General Electric with 2—35 H.P. Motors with reel.

BATTERY LOCOMOTIVES, 42" TRACK GAUGE

- 3—Greensburg Monitors complete with charging equipment and batteries.

LOADING MACHINES, 250 VOLTS DC

- 7—11BU Joy Loading Machines, completely modern with separate pump motors.
- 6—360 Goodman Loading Machines.
- 2—14BU-7B6 Joy Loading Machines, 220 Volts AC, Excellent condition.
- 1—14BU-7CE Joy Loading Machine, 250 Volts DC, Excellent Condition.

MOTOR GENERATOR SETS

- 2—General Electric 300 KW Motor Generator Set, 1200 RPM, primary voltage 2300/4160, 275 Volts DC Complete with panel boards.
- 1—General Electric 200 KW Motor Generator Sets, 1200 RPM, 2300/4160 primary voltage, 275 primary voltage 2300/4160, 1200 RPM, 275 Volts DC Complete with panel boards.
- 1—Westinghouse 150 KW Motor Generator Set, 1200 RPM, 2300/4160 primary voltage, 275 Volts DC, complete with panel boards.

ELEVATING CONVEYORS

- 3—P111-16RPE Joy Elevating Conveyors—Straight dump.
- 3—P111-16RPE Joy Elevating Conveyors—Converted to side dump.

BELT CONVEYORS

- 1—Barber Green 36" Lattice Frame Conveyor complete with belt and 15 h.p. 220/440 volt AC drive, Excellent.
- 1—Barber Green 36" Stacker Conveyor complete with belt, 25 h.p. 220/440 volt drive, 60 ft. long; including "A" Frame and electronic hoist.
- 2000—ft. Ajax Raynile #130, 42" wide conveyor belt, 1 1/2" top cover 1 1/16" bottom cover, 6 ply, with nylon breaker, Excellent condition.
- 3000—36" Conveyor Belt, 5 ply, 36 oz. Good Condition.

MINE CARS

- 57—American Car & Foundry 3 door drop bottom mine cars, 18 3/4" overall length, 6' 10" wide, 34" overall height without 10" factory sideboard, 42" track gauge.

WIRE CABLE MATERIAL

- 35,000 ft.—6/0 fig. 8 Trolley Wire.
- 3000 ft.—4/0 three conductor 5000 Volt rubber covered cable with 3 ground wires and copper sheath over each conductor.
- 495 ft.—1/0 three conductor 5000 Volt rubber covered cable w/ground.
- 7000 ft.—2/0 three conductor 2300 Volt rubber covered bore hole cable.
- 3000 ft.—4/0 three conductor 5000 Volt trench cable.
- 4000 ft.—2/0 three conductor 5000 Volt trench cable.
- 350 ft.—2,000,000 CM Rubber covered Feeder Cable. (New)

TRACK MATERIAL

- 300—Tons 60 lb. Relaying Rail. Excellent condition.
- 150—Tons 70 lb. Relaying Rail. Excellent condition.
- 100—Tons 90 lb. Relaying Rail. Excellent condition.
- 1000—40 lb. Steel Ties, 42" Track Gauge.
- 50—40 lb. Switches complete
- 50—60 lb. Switches complete
- 1—American Mine Door Automatic Electric Switch Throw complete. All types miscellaneous track material.

COMPLETE FOUR-TRACK TIPPLE CAPABLE OF HANDLING 10,000 TONS OF COAL PER DAY

- Partial List of Major Items of Tipple:
Sizes of coal: from 1/4 x 0 to 7 x 4" Block
- CMI 48" Dryer—complete with motors, drives, belt, etc. screen cloth 1/16" opening, capacity 90 ton per hour.
- 1—Coppus Ventair Blower #24708.
- 5—5x6 Allis-Chalmers Centrifugal Pumps, complete with motors (4) breakers.
- 1—16x14 Allis-Chalmers Centrifugal Pump, complete with motor, starter, breakers.
- 1—Roberts & Schaefer Electric Vibrator.
- Consists of Belt & Chain Conveyors complete with motors, drives, 36" Belt also some 24x30" Belt.
- 1—Roberts & Schaefer Air Drying Plant (specifications furnished on request)

TRACK CLEANERS

- 1—Canton Track Cleaner, 42" gauge. Excellent condition.

WELDERS

- 2—Lincoln 300 amp. MG type, DC.
- 2—Hobart 300 Amp. MG type, DC.
- 4—Guyan Resistance Bonders

AIR SHOOTING EQUIPMENT

- 4—Armstrong Coal Breakers. Model EB-301, equipped with 60 h.p. motors, either 220/440 volt AC or 250 volt DC, complete with auxiliary equipment and controls. Excellent condition.

PORTAFEEDER

- 1—Nolan Portafeeder complete. Excellent condition.

COAL DRILLS

- 5—Manson Trucks—10 H.P., DC Tram Motors on 4, 7 1/2 H.P. DC Tram Motors on 1, Joy 9 J Motor with Reduction on 1. Each drill truck has 2 drill arms with 2 Chicago Pneumatic 580 Drills 7 1/2 H.P., DC.
- 3—Manson Track Trucks, each truck with 2 drill arms & 2-580 Drills.
- 2—Manson Track Trucks, without drills.
- 2—Dooley Rubber Tired Drill Trucks, equipped with two arms and two 580 drill motors.
- 9—Chicago Pneumatic #572, 220 Volt AC Coal Drills.

ROOF DRILLS

- 1—Joy RBD-7 with 15 HP Reliance Permissible DC and mounted on Manson with 7 1/2 H.P. Westinghouse on Rubber.
- 1—Jeffrey 56 R.D. with 15 H.P. Motor DC, arm is mounted on Manson Track Truck.
- 1—Dooley (Rubber Tired) Drill Truck, equipped with Vertical Drilling 580 Drill Motors.
- 1—Fletcher Roof Bolter complete with Dust Collector, Permissible, 250 Volts DC, like new.

ROCK DUSTERS

- 1—American Mine Door Road Cleaner
- 2—MSA Rock Dusters, 25 H.P. Track Permissible

TRUCKS

- 4—(Shop Built) Mobile Repair Trucks
- 3—Personnel Jeeps, 42" Track Gauge.

FANS

- 1—Jeffrey Aerodyne Fan, Serial No. 8687 complete with G. E. 100 H.P. 440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven.
- 1—4 ft. Jeffrey Aerodyne Fan complete with 60 H.P. 220/440 Volt AC Motor and Auxiliary Ford Industrial Power Unit gasoline driven, complete with all necessary equipment and controls.

TRANSFORMERS

- 3—2300/4160 Y, 230-115 Volts, 200 KVA General Electric Single Phase Transformers.
- 3—2300/115/230 Volt, 15 KVA General Electric Single Phase Transformers.
- 3—50 KVA, 2300/4160 Y, 240/480 Volt General Electric Single Phase Transformers.

CRUSHERS

- 1—McNally Pittsburg 24 x 36 Stoker Crusher complete with extra set new segments and 40 h.p. 220/440 volt drive.
- 1—American Pulverizer 36 x 42, 200 tph, #AC-3B.
- 1—American Pulverizer 24 x 24, 30 tph #WC-24, Heavy Duty.
- 1—American Pulverizer 36 x 30, 160 tph, #AC-3, screen plate type.
- 1—American Pulverizer 24 x 30, 75 tph, #WC-30, Drop cage type.
- 1—American Pulverizer 36 x 30, 100 tph, #AC-30-S, Special heavy duty type.

SUPPLY HOUSE

- Complete inventory of new parts for 10SC, 10RU and 11BU Joy Equipment plus cable, tools, hardware, etc. for operation of mine.

BATHHOUSE EQUIPMENT

- 150—Baskets with Chains, 20 shower heads and complete equipment for operation of bathhouse.

MOBILE EQUIPMENT

- 1—Koehring Heavy Duty Crane—C5521.
- 1—Shovel Dipper Stick for same—Size 301, Serial No. 61. Length 16 feet—3/4 yard dipper.
- 1—International 1950 Flat Bed Truck Tandem with steel bed and winch, Ser. #3438, 3 axles, weight 18,500 lbs.
- 1—Haugh Pay Loader, Model HF and HFN, Serial No. 81221.
- 1—Allis Chalmers Tractor Hi Lift, Model HD5, Model #24-27482, Serial No. 22246.
- 1—Caterpillar Tractor D6, 60" Gauge, Serial No. 5R4778.
- 1—Whiting Track Mobile, Serial #TM-209.

COMPLETE SHOP AND OFFICE EQUIPMENT STATIONARY MOTORS

- AC and DC Motors ranging from 1 to 100 H.P.

MISCELLANEOUS

- 1—Iron Fireman, 401 Series, Pneumatic Industrial type Spreader Stoker complete with controls.
- 1—75 Ton Fairbanks Morse Truck Scale.
- 1—5" Pomona Deepwell Pump, complete with 25 h.p. 220/440 volt AC motor and 31—10 ft. Joints 5" Pipe.

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- 3—118U Joy Loaders, 250 V. D.C.
- 5—88U Joy Loaders, A.C. & D.C., rebuilt
- 1—148U-7RAE Joy Loader, 250 V. D.C.
- 2—148U-7RBE Joy Loaders, 250 V. D.C.
- 3—148U-7BE Joy Loaders, 250 V. D.C.
- 3—148U-3PE Joy Loaders, 250 V. D.C.
- 8—148U-2E Joy Loaders, 250 V. D.C., 28" O.H.
- 3—128U-9E Joy Loaders, 250 V. D.C., rebuilt
- 3—208U Joy Loaders, 250 V. D.C., Permissible
- 1—360 Goodman Loader, on rubber, 250 V. D.C.
- 6—Long 88 Pig Loaders, 250 V. D.C.
- 1—24BB Clarkson Loader, 250 V. D.C.
- 1—Eimco 21 Rock Loader

SHUTTLE CARS

- 5—60E-10 Joy Shuttle Cars, w/Elevators, matched pairs, 250 V. D.C.
- 9—42E Joy Shuttle Cars, 250 V. D.C.
- 5—55C Joy Shuttle Cars, w/Elevators, 250 V. D.C.
- 17—65C Joy Shuttle Cars, matched pairs, 250 V. D.C.
- 2—85C Joy Shuttle Cars, Elevating Discharge, Permissible Plates, Excellent condition, 250 V. D.C.
- 15—32E-10 & 32E-16 Joy Shuttle Cars, Excellent condition, 250 V. D.C.
- 3—32D Joy Shuttle Cars, complete w/batteries
- 2—MT66-A45 Jeffrey Shuttle Cars, 250 V. D.C. matched pairs permissible, Excellent condition

CONTINUOUS MINERS

- 1—3-JCM Joy Continuous Miner, 250 V. D.C. Excellent condition

CUTTING MACHINES

- 5—12RB Joy Cutting Machines, 250 V. D.C., Permissible, Dual Wheels, Bugdusters, 9' Bar, Excellent condition.
- 5—11RU Joy Cutting Machines, 250 V. D.C., Permissible, Bugdusters, one completely rebuilt
- 1—70-URB Jeffrey Cutting Machine, 250 V. D.C., Excellent condition
- 1—29U Jeffrey Cutting Machine, 220/440 V. A.C., completely rebuilt, 36" t.g.
- 12—512 Goodman Cutting Machines, 250 V. D.C., Hydraulically or Manually Controlled
- 1—824 Goodman Slabber, 250 V. D.C.
- 46—35B and 35BB Jeffrey Cutting Machines, A.C. and D.C.
- 5—7AU Sullivan Cutting Machines, 250 V. D.C.
- 6—7B Sullivan Cutting Machines, 250 V. D.C.
- 16—11B Sullivan Cutting Machines, 35 & 50 h.p., 250 V. D.C.
- 15—12AB, 12AA and 112AA Goodman Cutting Machines, 250 V. D.C.
- 5—212AA Baby Goodman Cutting Machines, 250 V. D.C.
- 1—712CJ Goodman Cutting Machine, 250 V. D.C.

BELT CONVEYORS

- 1—36" Joy Model "C" Belt Conveyor, 1,080' centers
- 6—MTB 30 Joy Tandem Belt Conveyors, 1,000' centers, 25, 40 and 50 h.p., one with Scandura Flame Proof Belting
- 1—30" 97HC Goodman Belt Conveyor, 1,000' centers with 25 h.p. Tandem Drive
- 4,280'—30" 99-5GT Goodman Belt Conveyor structure
- 5—99-5GT Tandem Belt Conveyor Drives
- 1—30" Shop Constructed Belt Conveyor Drive
- 8,760'—26" Joy Model "C" Structure
- 18—26" Belt Conveyor Drives, various makes
- 1—26" MTB Joy Tandem Belt Conveyor, 1,000' centers

MISCELLANEOUS TRACKLESS EQUIPMENT

- 1—WK-83R Joy Compressor, 250 cu. ft.
- 1—WL-82 Joy Compressor, 125 cu. ft.
- 2—T2-SAE & T2-2E Joy Machine Trucks
- 2—T14G Joy Machine Trucks, 220 V. A.C.
- 1—Lot 9J, 10J, 23J and 24J Motors

PREPARATION EQUIPMENT

- 1—4 Cell Jeffrey Baum Jig Washer, complete, 300 t.p.h. capacity
 - 1—Simon Carver Heavy Duty 2 compartment Baum Jig, 400 t.p.h. capacity
 - 1—Daniels Heavy Media Washer
 - 1—48" CMI Centrifugal Dryer
 - 1—Heat Dryer, complete
 - 1—36" x 130" Hot Material Handling Belt, Excellent
 - 4—7' x 15' Single Deck Diester Tables
 - 1—36" x 33" Marion Double Roll Crusher
 - 1—30" x 36" Jeffrey Double Roll Crusher, Like New
 - 1—30" x 30" Link Belt Double Roll Crusher
 - 1—24" x 50" Pa. Single Roll Crusher
 - 3—24" x 24" Jeffrey Single Roll Crushers
 - 1—2' x 4' Williams Pulverizer
 - 1—18" x 24" McClanahan & Stone Single Roll Crusher
 - 1—6' x 14' Single Deck Allis Chalmers Low Head Vibrator, Like New
 - 1—5' x 12' Allis Chalmers Triple Deck Low Head Vibrator
 - 1—5' x 12' Allis Chalmers Rip-Flo Double Deck Vibrator
 - 1—5' x 10' Double Deck Robbins-Gyro Vibrator, Like New
 - 1—4' x 12' Hewitt Robbins Vibrex Screen, Triple Deck
 - 5—4' x 7' Jeffrey Traylor Double Deck Vibrators
 - 2—4' x 7' Jeffrey Single Deck Vibrators
 - 1—3' x 4' Single Deck Gyro Vibrator
 - 2—3' x 8' Low Head Vibrators
 - 1—30" x 72" Jeffrey Traylor Double Deck Vibrator
 - 2—Magnetic Separators, complete
 - 1—Set Jeffrey Dewatering Screens
 - 4—Scraper Conveyors of various sizes
 - 15—Drag Conveyors of various sizes
 - 1—370' Jeffrey Rope & Button Conveyor
 - 11—Boom Hoists from 1 ton to 5 ton
- We can construct loading booms and tippie belt in any size.

CHAIN AND SHAKER CONVEYORS

- 20" Joy Chain Conveyors, A.C. & D.C., Permissible
- 15" Chain Conveyor Drives, A.C. & D.C., Permissible
- 15" Long Chain Conveyors, A.C. & D.C.
- 12" & 15" Jeffrey Chain Conveyors
- 12" Goodman Chain Conveyors
- PT12 Long Piggyback Conveyors
- PT12-B Long Piggyback Conveyors
- Goodman G12½, G15 & G20 Shaker Conveyor Drives
- Joy Ladel UN17 Shaker Conveyor Drives
- Goodman Power Duckbills & Duckbill Hoists

LOCOMOTIVES, 250 V. D.C.

- 3—20 Ton Jeffrey MH77 Locomotives, 42" & 48" t.g.
- 1—15 Ton HM828 G.E. Locomotive, 90 h.p. units, 44" O.H., 48" t.g., Excellent
- 11—13 Ton Locomotives, 250 V., any gauge
- 1—12 Ton 29B Goodman Locomotive, 40" O.H.
- 10—10 Ton Locomotives, 250 V., any gauge
- 20—8 Ton Locomotives, 250 V., any gauge
- 29—6 Ton Locomotives, any gauge
- 4—6 Ton Jeffrey MH150 Locomotives
- 12—6 Ton MH88 Jeffrey Locomotives
- 11—5 Ton Locomotives, 250 V.
- 17—4 Ton Locomotives, 250 V., any gauge

BATTERY LOCOMOTIVES

- 5—7 Ton Atlas Locomotives
- 2—6 Ton Mancha Locomotives, 36" t.g., 47" O.H.
- 1—4 Ton G.E., 48" t.g.
- 1—4 Ton Mancha Locomotive, 48" t.g.
- 1—4 Ton Ironton Locomotive, complete w/charger, 44" t.g.

SUB STATIONS & TRANSFORMERS

- 1—300KW Westinghouse Stationary Rectifier, completely rebuilt
- 1—Westinghouse A.C. Sub Station, 4500 KVA, 6900/2300, complete w/boards, Excellent
- 3—300KW M. G. Sets

- 5—200KW M. G. Sets
- 3—200KW, HCC-6-1200 G.E. Rotary Converters, Automatic
- 2—150KW G.E. Rotary Converters, w/Transformers
- 1—150KW Westinghouse Rotary Converter, Completely Automatic
- 19—150KW M. G. Sets of various makes & voltages
- 2—100KW M. G. Sets
- 1—100KW Westinghouse Generator, 250 V. D.C., connected to Buda Diesel Engine, complete w/boards
- 2—100KW Generators, w/671 G. M. Diesel
- 1—90KW Generator, w/671 G. M. Diesel, Excellent
- 1—75KW Generator, w/10019 Diesel Engine
- 1—85KW Generator, w/75 h.p. G. M. Diesel w/ITE Automatic Control Board
- 1—100KVA Gasoline Alternator Unit
- 1—50KW M. G. Set, 125 v., D.C., 1200 rpm
- 2—Armatures for 200KW Rotary G.E., type HCC
- 2—600 & 800 Acute Transformers
- 168—Transformers from 1½KVA to 800KVA, list sent upon request

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- 50—36" t.g. Phillips Clay Cars, 50" O.H., Excellent
- 40—36" t.g. Drop Bottom Cars
- 128—42" t.g. End Dump Cars, various makes
- 277—42" t.g. S. D. Drop Bottom Mine Cars
- 50—42" t.g. A.C.F. Drop Bottom Cars
- 140—44" t.g. Drop Bottom Cars, various sizes
- 356—44" t.g. End Dump Cars, various sizes
- 82—48" t.g. S. D. Drop Bottom Cars
- 259—48" t.g. A.C.F. Drop Bottom Cars
- 6—48" t.g. Man Trip Cars
- 2—56½" t.g., 3 ton, 4 wheel push trucks (New)

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 - 1,000'—500,000 CM Bare Copper Feeder Cable
 - 15,000'—2/0, 3 cond. Copper Cable, Insulated
 - 37,600'—1/0 Solid Copper Highline Wire
 - 15,000'—#1 Solid Copper Highline Wire
 - 2,643'—#2 Stranded Copper Highline Wire
 - 160,400'—#2 Solid Copper Highline Wire
 - 1,595'—#4 Solid Copper Highline Wire
 - 3,773'—#6 Solid Copper Highline Wire
 - 10,130'—4/0, 3 cond. rubber covered cable, 5,000 V., Excellent condition
 - 5,000'—2/0, 3 cond. Anhydrex & Lead covered Transmission Cable
 - 8,000'—2/0 Single Cond. Insulated Copper
 - 7,500'—2/0 Insulated Cable, 600 V.
 - 1,500'—600 V. Bronco 60 Neoprene certified type W, 2 cond., #6 Copper Wire P1168M, Like New
- Several thousand feet #2, #3 and #4 approved type machine cable, 3 & 4 conductor.

MISCELLANEOUS

- 1—TD9 International Hi-Lift
- 1—Canton Track Cleaner, Excellent
- 15—HKL, HKG, HKC, HL & CR Brown Fayro & Sullivan Hoists
- 49—Air Compressors of various sizes
- 57—Auto Starters from 3 h.p. to 100 h.p.
- 70—Hoists from 1½ to 800 h.p.
- 6—Shop constructed Jeeps, track mounted
- 7—Hydraulic Schroeder Coal Drills
- 93—Coal Drills, various makes and sizes
- 95—Pumps from ¾" to 4500 GPM
- 1—Pomona Deep Well Pump
- 1—14" Centrifugal Slurry Pump
- 33—Battery Chargers, various voltages
- 17,270'—Pipe: Galvanized, Plastic & Cast Iron
- 49—Room Blowers—Brown Fayro & Jeffrey
- 23—Mine Fans from 30" to 9' HI Pressure
- 15—Rock Dusters up to 30 h.p.
- 3—Phillips Machine & Shuttle Car Carriers, 36" to 48" t.g.
- 1—42 Ton Richards Truck Scale, 10' x 25' deck
- 562—Stationary Motors—½ to 800 h.p., A.C. and D.C. (List of motors available upon request)
- 11,200'—3" Plastic Pipe
- 800'—4" Plastic Pipe

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CALL US FOR YOUR MINING NEEDS, WHETHER BUYING, SELLING, OR TRADING. YOUR CONFIDENCE KEEPS US IN BUSINESS. IF WE ADVERTISE IT—WE OWN IT.

A. C. MINING EQUIPMENT FOR SALE

- 1—12G-3 Goodman Cutting Machine, A.C.
- 2—11BU-10APH Joy Loading Machines, 220/440 Volts A.C.
- 2—4JCM Joy Continuous Miners, 440 Volts A.C.
- 3—7B Sullivan Cutting Machines, 220/440 Volts A.C.
- 1—35L Jeffrey Cutting Machine, 220 Volts A.C.
- 2—14BU Joy Loading Machines, 220/440 Volts A.C.

LOADING MACHINES FOR SALE

- 1—14 BU-7RAE Joy Loading Machine, 250 Volts D.C.
- 1—18 HR Joy Loading Machine, 250 Volts D.C.
- 4—11 BU-10APE Joy Loading Machines, 250 Volts D.C.
- 1—14 BU-7BE Joy Loading Machine, 250 Volts D.C.
- 1—14 BU-3PE Joy Loading Machine, 250 Volts D.C.
- 5—12 BU-9E Joy Loading Machines, 250 Volts D.C.
- 4—8 BU Joy Loading Machines, 250 Volts D.C.
- 3—7 BU Joy Loading Machines, 250 Volts D.C.
- 2—Long 12" Piggyback Conveyors, each 300' long, complete with PT-12 Piggybacks and 12BU Joy Loading Machines.
- 2—14BU-7RBE Joy Loading Machines, 250 Volts, D.C., excellent condition.

SHUTTLE CARS FOR SALE

- 3—10SC Joy Shuttle Cars, 500 Volts D.C.
- 1—5SC Joy Shuttle Car, 250 Volts D.C.
- 2—6SC-7E Joy Shuttle Cars, Elevating Discharge, 4-Wheel Steering, 250 Volts D.C.
- 2—42E18 Joy Shuttle Cars, Disc Brakes, Elevating Discharge, Completely Modern, 250 Volts, D.C.
- 1—Standard, 1-Opposite Standard Drive.
- 2—60-E Joy Shuttle Cars, 250 Volts D.C.
- 1—10SC-2PBXE Joy Shuttle Car, Permissible, equipped with 40J, 15 HP Motors.
- 4—10SC Joy Shuttle Cars, 250 Volts D.C.

CUTTING MACHINES FOR SALE

- 1—512 EJM Goodman Cutting Machine, 250 Volts D.C.
- 2—29LC Jeffrey Cutting Machines, 250 Volts D.C.
- 2—10RU Joy Cutting Machines, 250 Volts D.C. with bugduster.
- 2—29UC Jeffrey Universal Cutters, Permissible, 250 Volts D.C.
- 1—512 CCH Goodman Cutting Machine, 250 Volts D.C.
- 4—35B Jeffrey Cutting Machines, 250 Volts D.C.
- 6—35BB Jeffrey Cutting Machines, 250 Volts D.C.
- 2—7AU Sullivan Cutting Machines, 250 Volts D.C.
- 5—35L Jeffrey Machine.
- 1—11RU Joy Cutting Machine, 250 Volts D.C.

CONTINUOUS MINERS FOR SALE

- 2—1CM Joy Continuous Miners, 250 Volts D.C.
- 3—4JCM Continuous Miners, 440 Volts A.C.
- 1—5 JCM Joy Continuous Miner with self-tramming and extensive belt, 440 Volt AC, complete with 1000 feet of structure and belting with bridge conveyor between miner and belt.

RECTIFIERS FOR SALE

- 1—400 KW American Selenium Rectifier, 4160 Volts Primary, 275 Volts D.C.

ROTARY CONVERTERS FOR SALE

- 1—300 KW Westinghouse, Pedestal Type Converter, 275 Volts D.C., Primary 2300/4000.

- 1—100 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.
- 1—200 KW General Electric HCC-6 Rotary Converter, 1200 RPM, 2300/4000 Volts Primary, 275 Volts D.C., Pedestal Type.

COAL DRILLS FOR SALE

- 25—CP-472 Electric Coal Drills, 250 Volts D.C.
- 5—CP-572 Coal Drills.
- 10—Chicago Pneumatic Little Giant 572 Coal Drills, 3 phase, 220 Volt A.C., permissible, New.

CRUSHERS FOR SALE

- 1—36" x 36" Double Roll Crusher, complete with 100 H. P. Motor.
- 1—Robins 36" x 36" Double Roll Stoker Crusher, specially built with spike teeth equipped with extra set of new segments.
- 1—Pennsylvania Single Roll Crusher, 24 x 40.

COMPRESSORS FOR SALE

- 2—Acme Self-propelled Air Compressors, 83R, Model 168, Capacity 176CFM, with 40 H.P. Reliance Compound Motor. Excellent Condition.

LOCOMOTIVES FOR SALE

- 1—MH-150 Jeffrey Locomotive, 42" track gauge, 250 Volts D.C., 26½" high, rebuilt.
- 1—General Electric 6 Ton Locomotive with Reel, 36" gauge.
- 1—1030 Goodman Locomotive, 24" high, 44" track gauge.

ROCK DUSTERS FOR SALE

- 1—MSA Track Mounted Rock Duster, 10 H.P., A.C., or D.C., high pressure, 30" high, any gauge.
- 2—MSA Bantam Rock Dusters, Rubber Tired, Portable.
- 2—MSA Bantam Rock Dusters, Skid Mounted.
- 1—American Mine Door, Wheel mounted bantam type rock duster, 250 Volts D.C., 22" high.

HOISTS FOR SALE

- 1—Brownie Hoist, 5 H.P., A.C.
- 6—#11½ Vulcan-Denver Material Hoists, Complete with 3 H.P. D.C. Compound Wound 1750 RPM General Electric Motor.
- 1—Brownie Hoist, Model HKO—Good condition.
- 2—Joy CHD Hoists, 10 H.P.

ELEVATORS FOR SALE

- 2—Joy PL11-16 Elevating Conveyors.

MACHINE TRUCKS FOR SALE

- 2—T2-5APE Joy Machine Trucks, 250 Volts, D. C.
- 1—T2-5APE Joy Machine Truck, AC.

CHAIN CONVEYORS FOR SALE

- 5—61AM Jeffrey Chain Conveyors, 10 H.P. 300' long.
- 3—61HG Jeffrey Chain Conveyors, 5 H.P. 40' long.
- 1—Jeffrey 300 ft. 15" Chain Conveyor.
- 1—350 ft. LaDel Conveyor Line, complete.
- 1—300 ft. Joy Pans and Chains, complete.

DIESEL PLANTS FOR SALE

- 1—90KW Diesel Generator Set, 250 Volt D.C. with 671 General Motors Diesel Engine.
- 1—D13000 Caterpillar Diesel Generator Unit—with Caterpillar engine and 75 KVA G.E. generator self-regulating, 220 Volt A.C.
- 1—75KN Diesel Generator Set, 250 Volt D.C. with 671 General Motors Diesel Engine.

MOTOR GENERATORS FOR SALE

- 1—150 KW General Electric Motor Generator Set, 2300 Primary, 275 Volts D.C.
- 1—50 KW Westinghouse MG Set, 440 Volt, A.C., 250 Volt D.C.
- 1—300 KW Westinghouse Motor Generator Set, synchronous motor, 443 KW Output, 435 KVA, 2200 Volts, 1200 RPM. D.C. generator 300 KW, 275 Volts, 1200 RPM. Compound Wound. Complete with D.C. panel and switch gear.
- 3—50 KW G.E. and Westinghouse Motor Generator Sets, 2300 Volts A.C., 275 Volts D.C. Complete with switching gear.

BELT CONVEYORS FOR SALE

- 1—36" Joy Self-Tramming Extensible Belt, 1200 ft. long with belt and drive.
- 1—30" Joy Self-Tramming Extensible Belt, 1000 ft. long with belt and drive.
- 1000 ft. — 97-C Goodman 26" Bell Structure.

ROOF BOLTING MACHINES FOR SALE

- 3—Fletcher Roof Bolting Machines; with permissible dust collectors.
- 1—Chicago Pneumatic RBD 30 Roof Drill.

THE FOLLOWING OFFERED AS A PACKAGE UNIT ONLY

- 1—SCM Joy Continuous Miner, 440 Volts A.C.
- 2—16SC Joy Shuttle Cars, matched pair, 440 Volts A.C.

MINE CARS FOR SALE

- 173—AC&F Drop Bottom Mine Cars, 42" track gauge, 48" high, 253 cubic feet.

MISCELLANEOUS FOR SALE

- 1—Compton Model 56 Auger with 300 H.P. Cummins Diesel Engine Drive, 210 feet 38" diameter auger (6 sections—35 feet each); 1—42" cutter head, 70 feet, 48" diameter auger (2 sections—35 feet each); 1—52" cutter head.
- 2—75 KVA Underground Transformers, Skid mounted 40" high.
- 3—30 KVA Underground Transformers, skid mounted, 40" high.
- 2—3 H.P. Gear Motors with 15" head and tail assemblies.
- 2—5 H.P. Gear Motors with 15" head and tail assemblies.
- 3—75 KVA Transformers, 2300/4000 Wye to 220 Volts.
- 3—35B Jeffrey Armatures, 250 Volts D.C.
- 4—902, 250 Volts D.C. Westinghouse Motor Units, only.
- 1—PL 11-14 Joy Elevator.
- 10—Goodman 512 Cutter Bars and Chains.
- 1—24" Fan with drive.
- 2—7½ H.P. Tricycle Type Rubber Tired Mine Tractors, 7½ H.P. 220 Volt Single Phase Motors or 250 Volt D.C. Motors.
- 3—24 J Motors, 7½ H.P. 250 Volt D.C.
- 2—42" Track Gauge Phillips Carriers.
- 1—Manson Mine Jeep 40" Track Gauge equipped with 9J Motor.

ALL EQUIPMENT LISTED AND HUNDREDS OF OTHER ITEMS ARE IN STOCK AND MAY BE INSPECTED AT OUR SHOP AND EQUIPMENT YARD LOCATED AT RALEIGH, WEST VIRGINIA

MOUNTAIN STATE EQUIPMENT COMPANY

Box 1050, Beckley, West Virginia

Phone CLifford 3-7383

J. J. MAHONEY

Res. Phone CLifford 3-6804, Beckley

WILLIAM R. MONK

Res. Phone CLifford 3-6907, Beckley

R. E. KAMM

Res. Phone 4281, Summersville

PROUD OF BEING "YES-MEN"

Whenever anyone asks us if we have the best buys from the largest stock of latest type mining equipment, we always say "YES". That goes for loaders, cutters, shuttle cars, substations, locomotives, mine cars, bell lines, tipples, copper wire, relaying rail, etc. from one item to a complete mine. "Known by the Reliability of our Service as well as the Quality of our Product".

JOY EQUIPMENT—REBUILT

- 3—Joy 148U 9AE Super Loaders—26" Ht.—New 1958.
- 3—Joy 148U Loaders, low pedestal, 7AE, 1956 & 57.
- 6—Joy 148U Loaders, medium pedestal, 7BE.
- 1—Joy 148U 7CE high pedestal loader.
- 4—Joy 148U 3PE Loaders.
- 2—Joy 128U Loaders complete with Piggybacks.
- 2—Joy 128U Loaders, 9E, latest type, 250 V. DC.
- 3—Joy 128U Loaders, 240/440 Volt AC.
- 1—Joy 208U Loader, latest type.
- 4—Joy 118U Loaders, latest type.
- 1—Joy 88U Loader, 34" overall height.
- 2—Joy 88U Loaders, 220 V. AC.
- 1—Joy curved Bar Head for 148U, complete.
- 6—Reliance 24-J Motors, 7½ H.P.
- 4—Reliance 38-J Motors, 10 H.P.
- 4—Reliance 40-J Motors, 15 H.P.
- 20—9-J Motors, 4 H.P.

- 2—Goodman 660 Loaders on Crawlers 440 V. AC., like new.
- 1—Goodman 660 Loader on Crawlers, excellent 250 V. DC.

- 1—Goodman 665 Loader on Crawlers, latest type 250 V. DC.

- 1—Goodman 665 Loader, 26" ht. Rebuilt. 250 V. DC.

- 4—Joy 88C Shuttle Cars, rebuilt.
- 6—88C Shuttle Cars, as removed from service.

- 4—Joy 88C Shuttle Cars, rebuilt, latest type.
- 1—Joy 55C Shuttle Car. Excellent.

- 2—Joy 32E Shuttle Cars.
- 2—Joy 32E10 Shuttle Cars, rebuilt.

- 6—Joy 32E15 Shuttle Cars, rebuilt.
- 4—Joy 32E16 Shuttle Cars, rebuilt.

- 10—Joy 42E16 Shuttle Cars, rebuilt.
- 1—Joy CD-22 Drill, on rubber, like new.

- 6—Joy T-2-5 low pan Crawler Trucks, rebuilt.
- 1—Joy T-2-6 low pan Crawler Truck with reel.

- 2—Joy T-1 Standard Crawler Trucks, 220 AC.
- 1—Joy T-1 Standard Crawler Truck, 250 DC.

- 4—Joy 11-B Cutting Mach., like new, 35 & 50 H.P.
- 1—Joy 7-B Cutting Machine, like new, 250 V. DC.

- 2—Goodman 212 Cutting Machines, 19" high.
- 1—Goodman 312 Cutting Machine, 17" high.

- 3—Goodman 412 Cutting Machines, 19" high.
- 1—Goodman Machine on Crawler, 31" high. All hydraulic.

- 6—Goodman 512 Machines with Bugdusters. Rebuilt.
- 6—Goodman 612 Cutting Machines, 250 and 500 V.

- 1—Jeffrey 70 URB rubber tired Cutter, Universal head, perfect condition.
- 1—Goodman 2410 Rubber Tired Cutter, Universal head, like new.

- 3—Joy 11RU Rubber Tired Cutters with Bugdusters, Universal heads, dual tires, like new, 250 V. DC.
- 1—Joy 10RU Rubber Tired Cutter, Universal head, 220/440 V. A.C. Perfect.

- 4—Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C. Rebuilt or as is.
- 6—7AU's on track. Universal head.

- 2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on Crawlers, 250 volt D.C.
- 1—Jeffrey 29LC on Crawlers, rebuilt.

LOCOMOTIVES

- 1—Goodman 6 ton, 93-A, 27" high, armor plate frame.
- 1—Jeffrey 15 ton MH-77 Locomotive, armor plate frame.

- 7—Jeffrey, 13 ton, type MH-110, 36", 42", 44" ga.
- 2—Jeffrey, 10 ton, type MH-110, 42" and 44" ga.

- 2—Jeffrey, 10 ton, type MH-78, 42" and 44" ga.
- 2—Goodman 8-30 and 10-30 Locos., 25" above rail.

- 1—Jeffrey MH-150, 6 ton, 26" overall height, rebuilt with reel.
- 12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" ga.

- 4—Jeffrey, 8 ton, type MH-100 2½" armor plate frames.
- 3—Jeffrey, 4 ton, type MH-96, 42", 44", 48" ga.

- 1—G.E., 4 ton, type 825 Locomotive, 22" high.
- 10—G.E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" ga.

- 1—G.E., 8 ton, type 822 Locomotive, 44" ga.
- 3—G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" ga.

- 2—G.E., 13 ton, type 829 Locomotives, armor plate frames.
- 1—Goodman 91A Locomotive, 8 ton, 26" overall height.

- 2—Goodman, type 33, 6 ton, 44" and 48" ga.
- 3—Westinghouse, type 902, 4 ton, 42" and 48" ga.

- 2—Atlas Battery Locomotives 36" ga.
- 1—Atlas Trolley Locomotive, 4 ton, 24" high.

- 2—Westinghouse, type 904, 6 ton, 44" and 48" ga.
- 2—Westinghouse, type 906, 4½" and 48" ga.

- 2—Westinghouse, type 907, 10 ton, 44" & 48" ga.
- 3—Westinghouse 908, 13 ton, Locomotives, 42" & 48" ga.

- 8—Jeffrey MH-78 Locomotive Units, cheap.
- 4—Jeffrey MH-88 Locomotive Units, real bargains.

- 6—Jeffrey MH-100 Locomotive Units, reasonable.
- 3—Plymouth Diesel Locomotives, 8 and 10 tons, 42" and 44" ga.

- Locomotive Trucks & Spare Armatures for the above.

TIPPLE EQUIPMENT

- 1—All Steel 5 Track Tipple, new 1957, complete with washer, silo, oil treating system, all bolted construction.

- 1—Complete Five Track Tipple with Washers and Air Tables.

- 1—Complete stoker plant, all steel.
- 2—Complete tipples, 3 & 5 track, steel and wood.

- 3—Cleaning Plants, 1 Ea. McNally, Roberts and Schaefer, Jeffrey, Washers and Air-Fluo Tables.

- 4—Complete Aerial Trams for coal or refuse.
- 3—Complete Rope and Button Lines.

- 2—Monitor Lines complete with Drums, excellent.
- 1—Allis-Chalmers 5' x 12' Rippflo Vibrator.

- 1—Allis-Chalmers 4' x 12' Low-Head Vibrator.
- 1—Robins Gyrex Vibrator, 4 x 10.

- 10—Belt and Apron type Loading Booms.
- 6—Shaker Screens.

- 1—Robins Car Shaker.
- 1—Gundlach Crusher, like new.

- 20—Crushers, various sizes—Jeffrey, McLanahan & McNally.
- 4—Mine Scales, 10 & 20 ton.

- 3—Truck Scales, 25 to 40 ton, late type.
- Feeders, Belt and Drag Conveyors, Car Retarders.

CUTTING MACHINES

- 1—Joy 10RU Rubber Tired Cutter, Universal head, 220/440 volt A.C. Perfect.
- 3—Joy 10RU Rubber Tired Cutters, Universal head, 250 V. D.C. As is or rebuilt.

- 2—Joy 11RU Rubber Tired Cutters, 250 V. D.C.
- 1—Goodman 2410 Rubber Tired Cutter, Universal head, new 1956. Excellent.

- 2—Jeffrey 29UC Universal Machines on Crawlers.
- 1—Goodman on Crawlers, 31" overall height.

- 3—Baby Goodman 212's, rebuilt, 250 V. D.C.
- 4—Goodman 312 Cutting Machines, 17" high.

- 4—Goodman 412 Cutting Machines, 19" high.
- 6—Goodman 512's, with Bugdusters, like new.

- 4—Goodman 512's, rebuilt, or as removed from service.
- 6—Goodman 612's—250 & 500 Volt.

- 3—Goodman 112's, 220/440 V. A.C.
- 1—Joy 7-B Cutting Machine, 250 V. D.C.

- 4—Joy 11B Cutting Machine, rebuilt, 35 & 50 H.P.
- 6—7AU's, on track, Universal Head.

- 10—Goodman 12AA's and 112AA's, 250 V. D.C.
- 2—Goodman 324 Slabbers.

- 2—Goodman 724 Slabbers.
- 2—Goodman 824 Slabbers.

- 6—Jeffrey 35L's, like new, 250 V. D.C., 17" high.
- 2—Jeffrey 35L's, on low volt trucks.

- 2—Jeffrey 35L's, 220/440 A.C.
- 3—Jeffrey 35BB's, 220/440 A.C.

- 15—Jeffrey 35B's and 35BB's 250 V. D.C.
- 2—Jeffrey 29B's on track.

- 10—Jeffrey 29C's, track mounted.
- 2—Jeffrey 29L's, on Crawlers. Excellent.

- 4—Sullivan CE7, 220/440 V. A.C.

CONVEYORS

- 2—Goodman 97HC 30" & 36" Rope Belts, 1600' perfect. With or without rubber.
- 2—Jeffrey 52-B tandem drive 30" Belt Conveyors, 1,500'.

- 1—Jeffrey 52-B tandem drive 26" Belt Conveyor.
- 1—Joy 30" Underground Belt Conveyor. Excellent.

- 1—Goodman 97-C, 30" tandem drive.
- 1—Goodman 97-G, 26" Conveyor, 1,000' long.

- 1—Robins 38" tandem drive, with or without structure.
- 1,200' Robins 38" Underground Structure, like new.

- 5,000' 52-B Belt Structure, 30".
- 1,000' Conveyor Belt, 42".

- 4,000' Conveyor Belt, 36".
- 3,000' Conveyor Belt, 30".

- 4,000' Conveyor Belt, 26".
- 8—Jeffrey 61AM 12" Chain Conveyors, 300'.

- 2—S1EW Elevating Conveyors.
- 2—S1WH 15" Room Conveyors, 300'.

- 2—Joy 15" Room Conveyors, 300'.
- 2—Joy 20" Conveyors, 300'.

- 4—Joy Ladel UN-17 Shakers.
- 10—Goodman G-12½ and G-15 Shakers.

- 1,000' Goodman 18" Flat Belt Conveyors, tandem drive any length. Perfect.

CONVERTERS AND DIESEL PLANTS

- 2—300KW G.E. Stationary Rectifiers.
- 4—1,000KW Stationary Rectifiers.

- 2—100KW, G.E. TCC-6's, 275V., Rotary Converters.
- 1—150KW, G.E. HCC-6, 275 V., Rotary Converter.

- 1—150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 V. D.C.
- 2—200KW G.E. HCC-6's, Rotary Converters, 275 V.

- D.C. Steel frames. Newly rewound.
- 3—300KW G.E. HCC-6's, Rotary Converters, 275 V. D.C. Like New.

- 2—300KW Westinghouse, 6 phase, Rotary Converters, 275 V. D.C.
- 1—500KW West. Rotary Converters, 275 V. D.C.

- 2—200KW Westinghouse Rotary Converters, 275 V. D.C. Newly rewound.
- (All the above with 6900/13000 and/or 2300/4000 primary transformers)

- 2—100KW MG Sets, 275 V. D.C.
- 2—150KW MG Sets, G.E. and West, 275 V. D.C.

- 1—200KW MG Set, West, rebuilt, 275 V. D.C.
- 1—200KW MG Set, G.E., perfect, 275 V. D.C.

- 2—300KW G.E. MG Sets, like new.
- 1—300KW Westinghouse MG Set, 275 V., rebuilt.

- 1—300KW Westinghouse, 600 volt MG Set, rebuilt.
- 2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.

- 2—500KW Westinghouse, 600 volt, D.C., 6 phase, Rotary Converters.
- 2—500KW HCC-6's, Rotary Converters, 6 phase, 600 V. D.C.

- 3—GMC-671 Diesels with 75 & 110KW, 250 V. D.C. Gen.
- 1—GMC-471 Diesel with 60KW, 250 V. D.C. Gen.

LOADING MACHINES

- 16—Joy Loaders, 148U, 128U, 88U, 118U, 208U.
- 5—Joy 128U9E Loaders, 220/440 V. A.C. Excel! Rent.

- 3—Joy 128U9E Loaders, latest type.
- 2—Joy 128U with Piggyback Conveyors.

- 2—Goodman 865 Loaders, 26", on Crawlers.
- 1—Goodman 665 Loader, on Crawlers, rebuilt.

- 2—Goodman 660 Loaders, 440 V. A.C., perfect.
- 1—Goodman 660 Loader, on Crawlers, 250 V. D.C.

- 1—Goodman 460, on track, rebuilt, all hydraulic.
- 2—Jeffrey 61 CLR's on rubber, 26".

- 3—Jeffrey L-1500 Loaders.
- 2—Myers Whaley, No. 3 Automatic Loaders.

- 2—Clarkson Loaders, 26" above rail.

MISCELLANEOUS

- 150 Tons Copper—4/0 and 9 Section Trolley 1/0, 2/0, 4/0, Stranded. 500 MCM, 750 MCM—1,000,000 MCM Insulated.

- 1 Each 4'-5' 8" & 8" HI Pressure Joy & Jeffrey latest type fans.

- 1—Complete Five Track Tipple with Washers and Air Tables.

- 5—Complete Tipples, 3 to 5 Track. Wood and Steel. Steel Trestles for drop bottom cars.

- All Steel Armo Buildings.
- 20—Jeffrey Molevays on rubber tires.

- 1—¾ Yard Shovel and Back-Hoe.
- 1—¾ Yard Crawler Crane.

- Battery Supply Tractors. Rubber Tired.
- 1—Cantrell Air Compressor on rubber tires.

- 10—Air Compressors, 1 H.P. to 40 H.P.
- 2—Joy self-propelled rubber tired comp., 240 cu. ft.

- 2—Acme self-propelled rubber tired compressors, 130 cu. ft.
- 40—Mine Pumps, all types.

- 1—Differential 40 Passenger Man-Trip Car.
- 6—MSA Rock Dusters.

- Joy Roof Drills—Schroeder Coal Drills.
- 2—Philips Carriers, 44" and 48" ga.

- 1—Barber-Greene self-propelled Bucket Elevator.
- Pipe, Plastic, Steel, Transit, all sizes 1" to 6".

- 25,000 Roof Belts, all types.
- 300—Mine Cars, drop bottom, 42" ga.

- 90—Mine Cars, drop bottom, 44" ga.
- 50—Mine Cars, drop bottom, 48" ga.

- 100—Mine Cars, 18" high, end dump, 44" ga.
- 300—Mine Cars, end dump and drop bottom, 20" high, 48" ga.

- 1—10 ton Mine Car Scale with Recorder.
- 4—Brown Fayro 15 HP latest type Hoists.

- 15—Brown Fayro HKL and HG Car Spotters.
- 1—Brown Fayro Hydraulic Car Spotter.

- 1—12 ton Differential Slate Larry.
- Incline Hoists, 25 to 50 H.P.

- 1—Jeffrey 8' & 8' Aerodyne Fans, Like New.
- 2—Storage Tanks, 4,000 Gallons.

- 2—Storage Tanks, 10,000 Gallons.
- 10,000 Five Gallon G.I. Cans, screw lids.

- 2,500 tons Relaying Rail, 25lb., 30lb., 40lb., 50lb., 60lb., 70lb., 90lb., 100lb.
- 500 MCM, 750 MCM, 1000 MCM, Bare & Insulated.

- Thousands of feet of rubber covered three conductor cable. All sizes.
- 300—Transformers from 1 to 300 KVA, 110 to 13,000 primary volts.

- 400—Electric Motors, 3 to 250 H.P.
- Huge Stock of Mine Supplies.

- 600—MSA Mine Lamps, Chargers, etc.
- 4—Mine Scales, 10 & 20 ton.

- 5—Truck Scales, 25 to 40 ton, late type.
- Mack & International tandem dump trucks.

- THOUSANDS OF OTHER ITEMS.

PHONE PL 2-4400

WE OWN WHAT WE ADVERTISE

J. T. FISH

LOGAN, WEST VA.

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Special Report to Users of Caterpillar Equipment:

Custom
**TRACK
SERVICE**

Custom Track Service saves coal stripper \$3298 by adding 3800 hours to track life

A coal stripper, ripping and 'dozing rocky overburden 7 days a week around the clock, was averaging 2300 hours of life before he replaced most of his totally destroyed track group parts. At the suggestion of his Cat Dealer, the stripper tried new, larger-size undercarriage parts. By following recommendations of the dealer's undercarriage specialist at 2440 and 4030 hours, the

undercarriage went a total of 6100 hours with only pin and bushing replacements . . . and all but the shoes were rebuildable instead of scrap! Up to this point, Custom Track Service saved the stripper a \$3298 cash outlay; and since he was able to rebuild the links and reuse the pins and bushings instead of replacing with new assemblies, he realized additional savings.

PAST EXPERIENCE



ALL BUT SHOES READY FOR
SCRAP PILE AFTER 2300 HOURS

PRESENT EXPERIENCE



COMPLETELY REBUILDABLE
EXCEPT SHOES AFTER 6100 HOURS

HOW CUSTOM TRACK SERVICE HELPS LOWER COSTS

Custom Track Service, available only from your Caterpillar Dealer, is designed to help you get the most possible service from undercarriage parts and thus cut costs. Factory-trained specialists are ready to help solve your particular track problems. They can give sound recommendations to help you get the most from your undercarriage.

They can advise you on maintenance . . . help you tailor the many special undercarriage parts and track options available to meet various job conditions. As a result, costs per hour go down and profit and machine availability go up.

These undercarriage specialists are backed by modern track undercarriage rebuilding facilities manned by experienced personnel . . . by the largest and most complete stock of standard and special application parts available . . . by Parts Exchange Assemblies that keep tractors working and earning.

Check with your Cat Dealer and learn how Custom Track Service can help you to reduce costs.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

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In 7 years of operation Tyler Ty-Rocks screen 15,000,000 tons of ore at Silver Bell Mine... "maintenance virtually nil"

These four single-surface Ty-Rock screens at the Silver Bell Mine of American Smelting and Refining Company have screened mountains of copper ore. Yet in seven years of operation the company reports "no bearing or other major replacements, and maintenance virtually nil"... a tribute to the fine operating staff and to the design of the equipment.

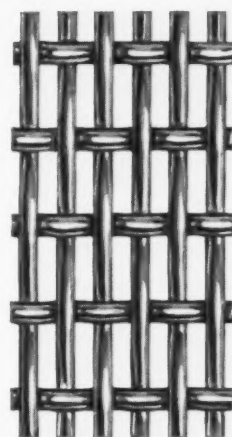
Tyler vibrating screens handle tremendous outputs with very high reliability. And no matter what your screening requirements, Tyler can handle them: heavy duty mechanical screens, electric screens, economical two-bearing screens. And—Tyler is the world's largest manufacturer of wire cloth and fabricated screen sections.

For screening equipment perfectly matched to your needs check with Tyler.

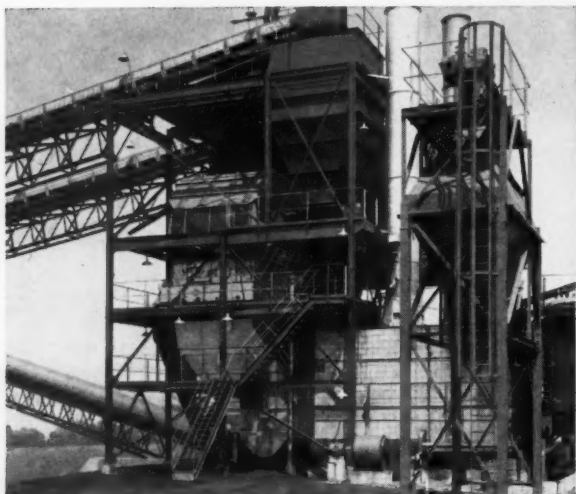
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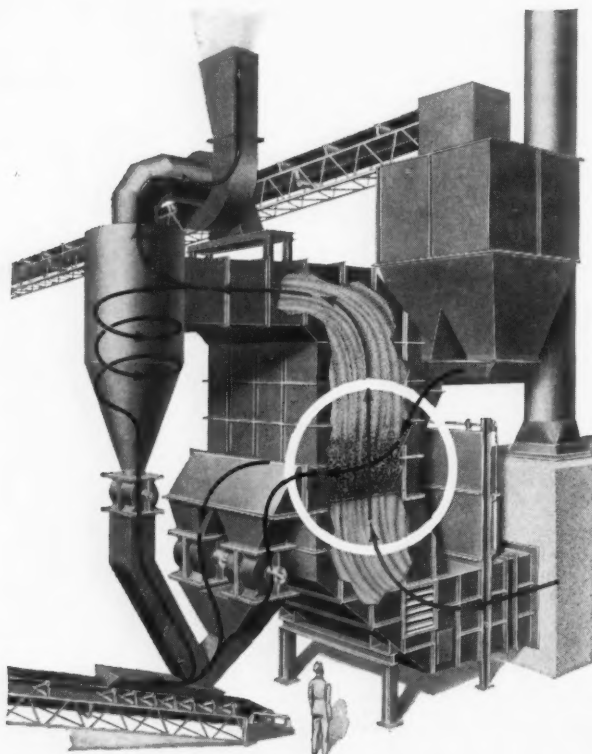
LINK-BELT FLUID-FLO DRYERS ...



ONE OF TWO 9' x 10' FLUID-FLO DRYERS which handle a total of 430 tph of sized coal. Surface moisture is reduced approximately 10%.



A 7' x 8' FLUID-FLO DRYER handles a total of 125 tph of $\frac{5}{8}$ x 0' in. coal. Surface moisture is reduced approximately 9.3%.



FLUID-FLO DRYER consists of a constriction plate over which material is fed. Hot drying gases, drawn upward through the plate by suction, fluidize the material above the plate. Each particle is enveloped by moving, drying gases.

dry even the most fragile coal with minimum degradation

Link-Belt's Fluid-Flo Dryer combines low initial cost and proven low maintenance operation with high capacity and high thermal efficiency—making it an economical answer to many of today's coal drying problems. Its action is so gentle that even the most fragile coal can be dried with minimum degradation.

HOW FLUID-FLO WORKS

Coal fed into Fluid-Flo passes over a constriction plate through which hot gases flow. These hot gases fluidize the coal, suspending and completely surrounding each particle to provide high thermal efficiency and quick moisture reduction. The suspended coal travels horizontally over the constriction plate to the discharge end of the dryer. Dried coal is discharged at a relatively low temperature through a motorized air lock. Air temperature is automatically controlled for most efficient drying. Maintenance of Fluid-Flo is low because there are no moving parts in the dryer—air alone does all the work.

TEST YOUR COAL

For a laboratory analysis of Fluid-Flo's performance in drying your coal, contact your Link-Belt office. Ask too, for Fluid-Flo Dryer Folder 2909.

LINK-BELT

COAL PREPARATION AND HANDLING EQUIPMENT

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15,853

See our exhibit, American Mining Congress, 1961 Coal Show, Public Auditorium, Cleveland, May 15-18, Booth 107

